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In This Issue—Charting Business Cost

MOTOR AGE

Volume XXXVIII
Number 7

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, AUGUST 12, 1920

Thirty-five Cents a Copy
Five Dollars a Year

\$75,000,000 Paid for Essex Cars

This Sales Growth Shows Why Essex Dealers Prosper

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And that is the basis of all value in a dealer franchise.

Of course such dynamic selling activity is wanted. But the question of permanency is just as important to the individual dealer as immediate profits and books full of orders ahead.

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The same men are responsible for both cars. The same policy is behind Essex that has made Hudson sales leader of the fine car field.

And 97% of the Hudson product is handled through

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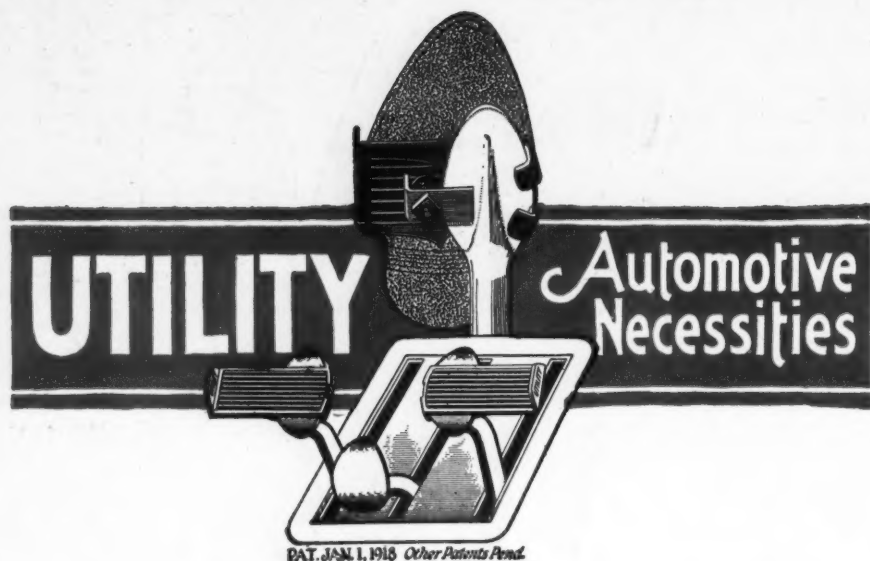
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CHICAGO

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THE ZINKE CO.

1323 S. Michigan Avenue, Chicago

MOTOR AGE

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No. 7

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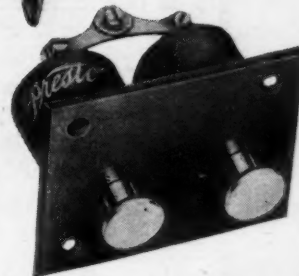
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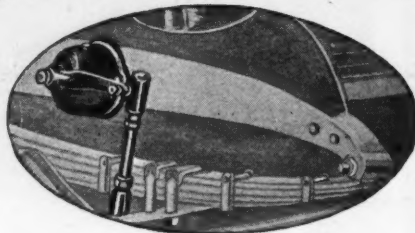
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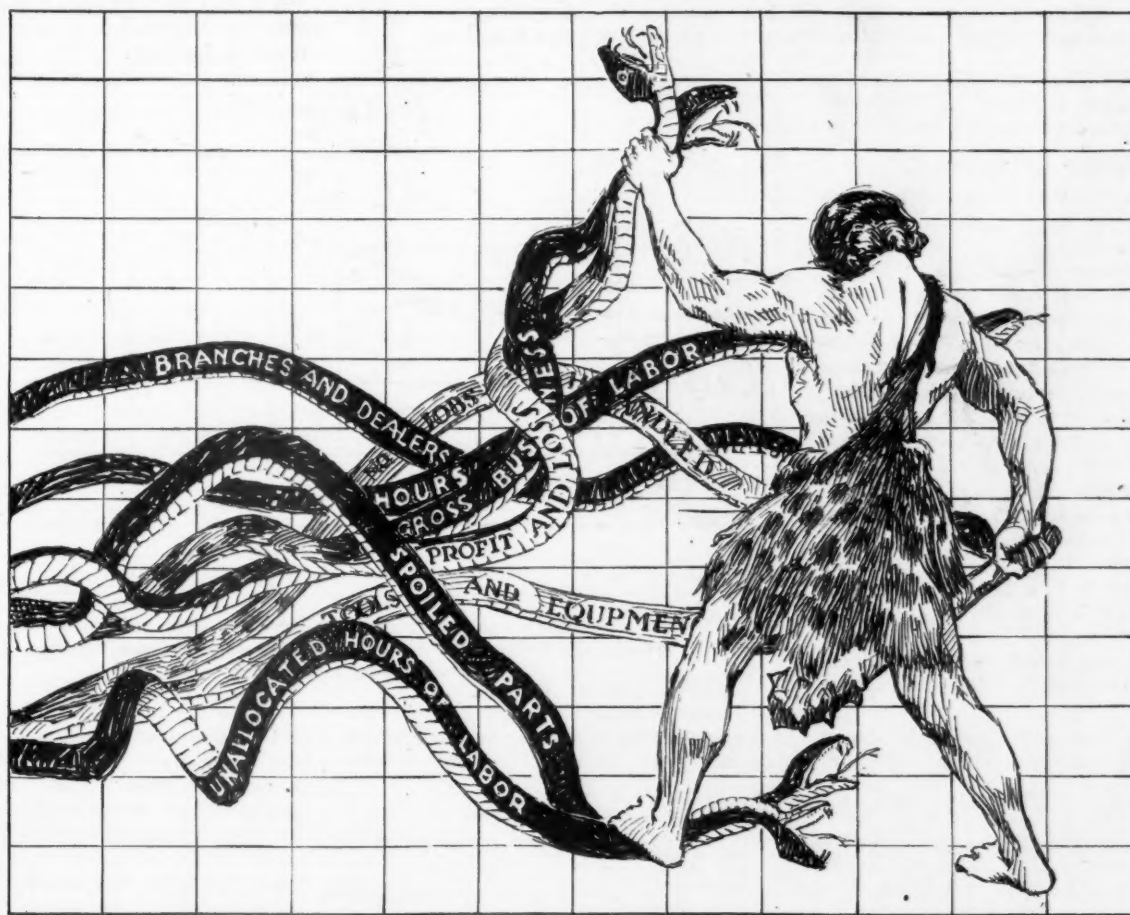
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MOTOR AGE

Know How Your Business Stands

Charting Your Records Will Tell You at a Glance Which Department Is Showing a Profit and Which Department Is Being Carried Along at a Loss



Many dealers' business, especially their service, might be likened to the tangled problem above. It is an unceasing battle against costs with no departmentized and no systematized records. The modern dealer cannot go about his work of throttling the vipers that are threatening to destroy his business with a club but he can adopt a system of curves plotted on a logical basis to tell him at a glance the condition of the various departments

EVERY service station that can be dignified by that name keeps records of various details connected with the business so that the head of the station or the owners can be fully informed as to the work, expenses and profits. Harry L. Ferris, service manager of the Auto-car Sales & Service Co., New York, has worked out a plan whereby he has all these records right at his elbow and yet does not have his desk cluttered up with a lot of reports. Here is how he works it:

Here are some of the things you can make curves for—

Gross business
Number of jobs handled
Profit or loss
Hours of labor
Non-chargeable hours of labor
Spoiled parts
Tools and equipment
Free service and guarantee work

All records which would have any bearing on the business of the station, profits, labor, etc., are transferred to line-ruled sheets. These sheets show the progress of the subject on that sheet and tell at a glance whether things are going backward or forward. Ferris has information instantly available, yet he has practically nothing on his desk except this "Black book" his pipe and an ash tray. Some of these records are checked up weekly and others monthly. All the sheets are made out for a period

Gross Receipts

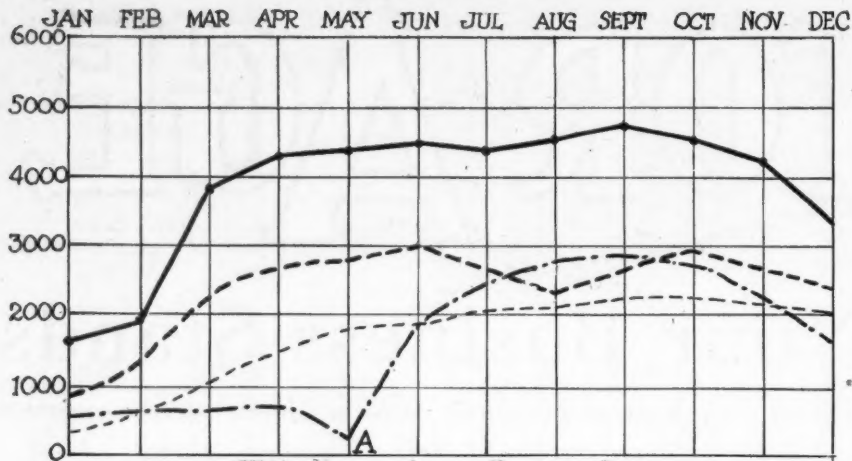


Fig. 1—Gross receipts curve. The curve "A" shows that during the month of May the business of this dealer was dropping off. A change in management or method changed this drop into a rapid rise during June and a slower rise during next two months

of one year. The charts shown here, while not copies of Ferris' records, show how the proposition can be handled.

GROSS BUSINESS

Fig. 1 is a chart of the gross business done by the service station for each of the twelve months. This includes not only the amount of cash taken in but also any bills receivable or any credits due the service station. The curve will naturally be seasonal and in the illustration the curve would be typical of that done by a passenger car service station. The greatest amount of work being done in the spring and summer when the cars are driven most. A truck station would show the winter time as the busiest season of the year and November and December would outstrip the other months. This is assuming that the service station is in a typical metropolitan district. If it is in a smaller city or a city where unusual seasonal happenings change the usual order of things, then the curves will directly reflect these conditions.

There are four different lines shown on the chart and these might represent

the business done by minor branches or dealers working under the service station in question. To illustrate how condi-

Profit or Loss

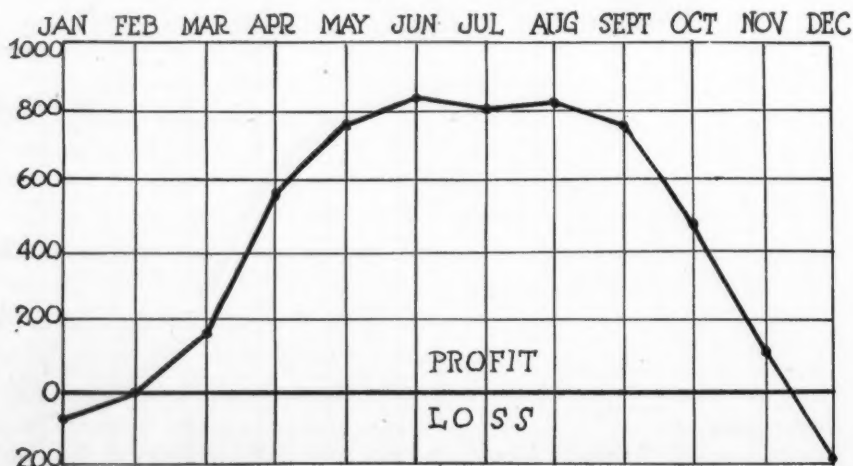


Fig. 3—Profit and loss curve. This is the real pulse of the business. If the gross business rises, but the profit does not, then there are expenses which should be looked into

tions can be observed, we will assume that at the point marked "A" there was a change in management or in the system which resulted in an immediate increase in gross business for this dealer. Columns of figures could not begin to show the improvement in this dealer's business the way the curve does.

NUMBER OF JOBS HANDLED

The number of jobs handled as shown in the curve in Fig. 2 will correspond very closely with the gross business because the two go hand in hand unless a lot of free service or guarantee work interferes with the relation of the curves. Any inordinate amount of this class of work would be immediately shown up on these curves.

The profit or loss curve is shown in Fig. 3 and shows the greatest profits during the spring and summer with a slight drop from November to December, but it will be seen that the curve is very substantially ahead of the point it started from in January.

Jobs Handled

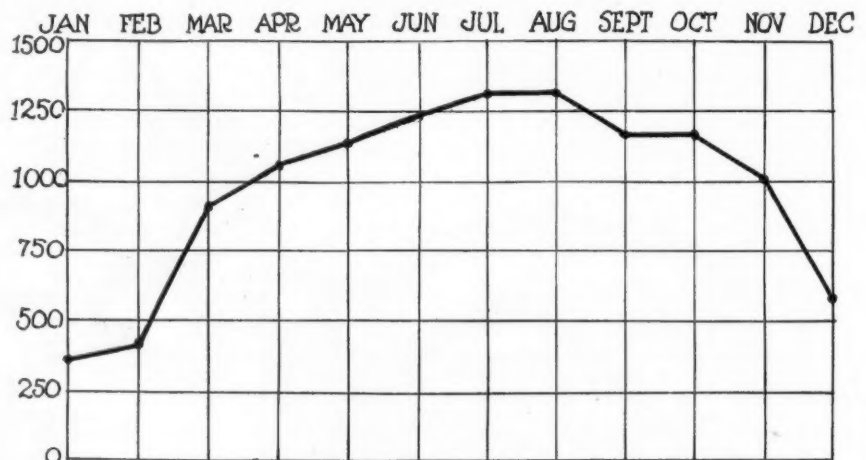


Fig. 2—Chart showing number of Jobs handled. This will follow closely the curve shown in Fig. 1, as more jobs are handled, the gross business will be greater

The hours of labor which the service station pays for are shown in the curve in Fig. 4. This curve will be nearly in direct proportion to the number of men employed. A curve might be made out, "Number of employees" but this would really not be as accurate as the hours of labor, because the latter includes all overtime which the former does not.

UNALLOCATED HOURS OF LABOR

In Fig. 5 the unallocated hours of labor are charted. This means the number of hours of labor that the service station pays for that it is not able to charge to the customers. There are some kinds of labor around the shop that are always unallocated such as superintendence, porters, stockmen, etc., but when work gets slack, most shops, instead of laying off the men, set them at overhauling shop machinery, rebuilding spare parts, etc., and so in slack time the curve goes up, and generally when this curve goes up, the profits curve comes down. The manager, by watching this curve, can tell whether he is overstocked with

Hours of Labor

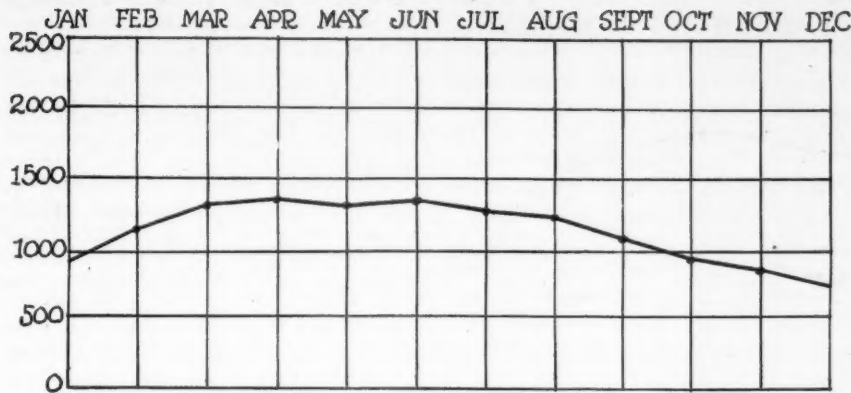


Fig. 4—Hours of labor curve which will follow in a general way the gross business and the number of jobs handled

labor and by comparing the curves of minor dealers or branches, he can check up the inefficient stations.

THE SPOILED PARTS PROBLEM

Spoiled parts are a consideration in any shop and there are many ways of treating this problem. The curve in Fig. 6 shows the manager whether this source of loss is increasing or decreasing. We may assume that at the point marked "B" some innovation was made in the system of handling spoiled parts that materially reduced the spoilage.

An idea which has reduced spoiled parts 75 per cent has been devised by Ferris and this is in the form of a card. Fig. 7 shows both sides of this card. The front has spaces for the name of the mechanic, the order number, date and job on which the spoiled part was found and sufficient space to make a brief statement of the name and character of the spoilage. This is signed by either the shop foreman or the superintendent. On the other side of the card are a number of blank lines on which the mechanic is supposed to write an explanation of how the spoilage occurred, and a place for the foreman's signature.

This correspondence is all taken care of through the foreman who is over the particular mechanic and the foreman signs the report after the explanation has been written out by the mechanic.

Spoiled Parts Value

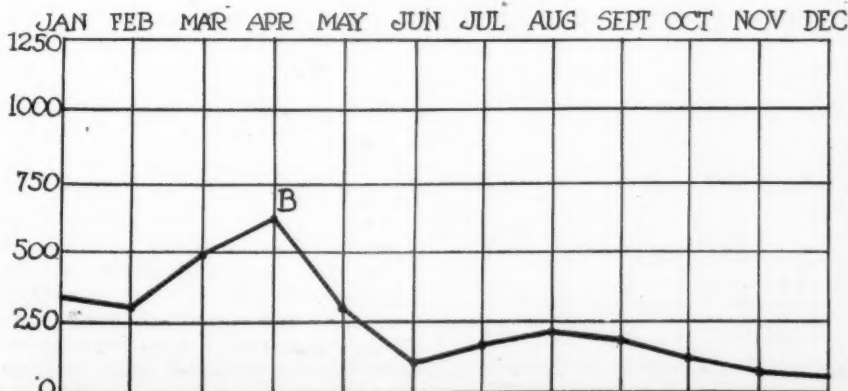


Fig. 6—Spoiled parts curve. The point marked "B" shows that some system was installed which reduced spoilage 75 per cent in two months

When a spoilage occurs, the statement of facts is made out on the face of the card and it might read as follows:

NAME *John Jones*
 You are listed with the following SPOILED PARTS
 Order No. *73461* Date *5/5/20*
 Job No. *Engine Rebuild*
Engine not running
due to tight valve gear
had to be fixed
by and turned back
for free replacement
Richard Roe Supt.

The reverse side might be worded as follows:

EXPLANATION
The valve was new model
heavy and it did
not close properly
and the owner
did not want to
pay for it, I
did not know just
how tight to set heavy
 Signed *John Jones*
 Foreman *Alfred Green*

Unallocated Hours of Labor

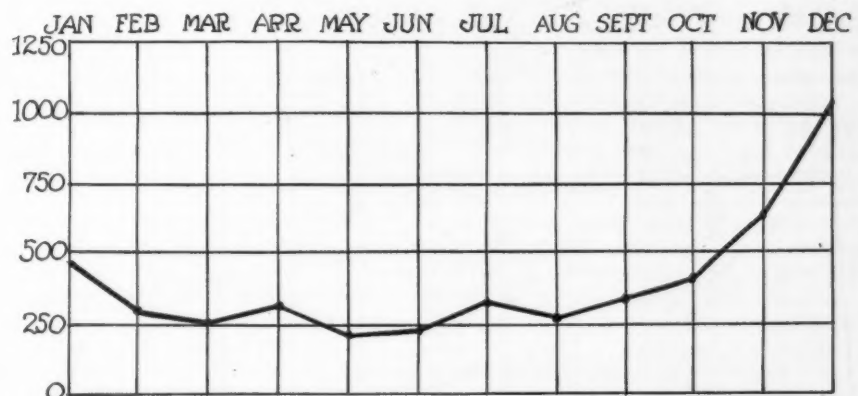


Fig. 5—Chart showing unallocated hours of labor. These are hours which cannot be charged to jobs and, as the curve rises, the profits will drop because the station pays for these hours but does not get any return

therefore there was a possibility of spoilage being charged to a man when somebody else was really chargeable with it.

Men Take More Care

This was accepted by the men and the explanations were interesting, truthful as a rule and not only this, but some of the explanations showed that certain methods of doing the work or certain equipment was to blame for certain spoilage and these were immediately corrected. The men, knowing that they would have to write a written explanation for every spoiled piece, took increased pains with their work and as the spoilage went down, of course the profits went up.

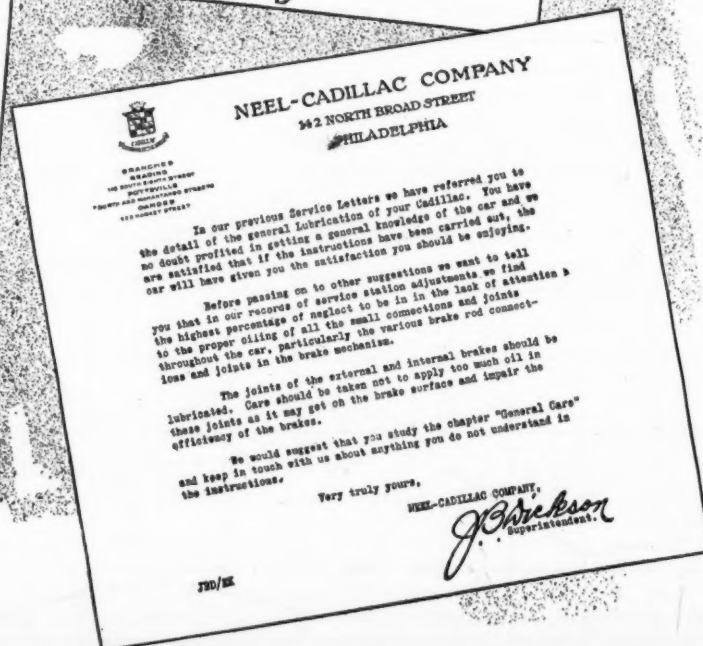
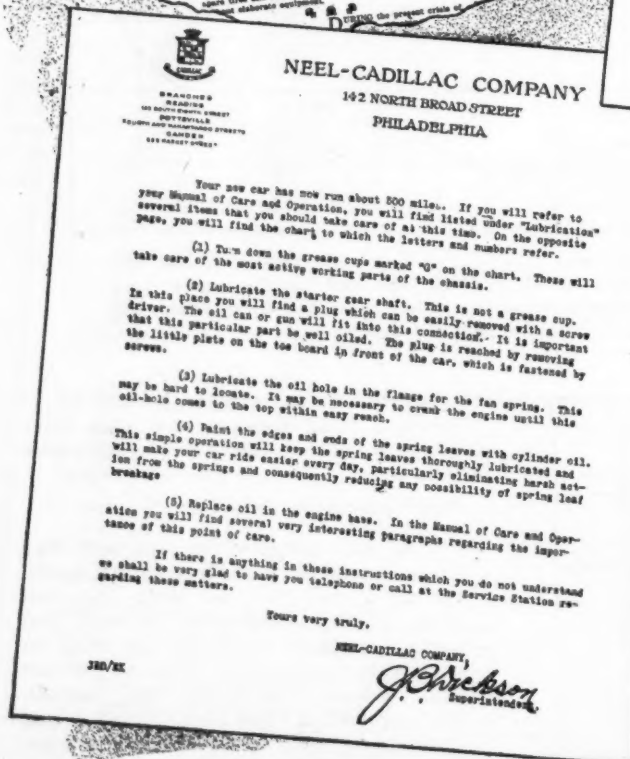
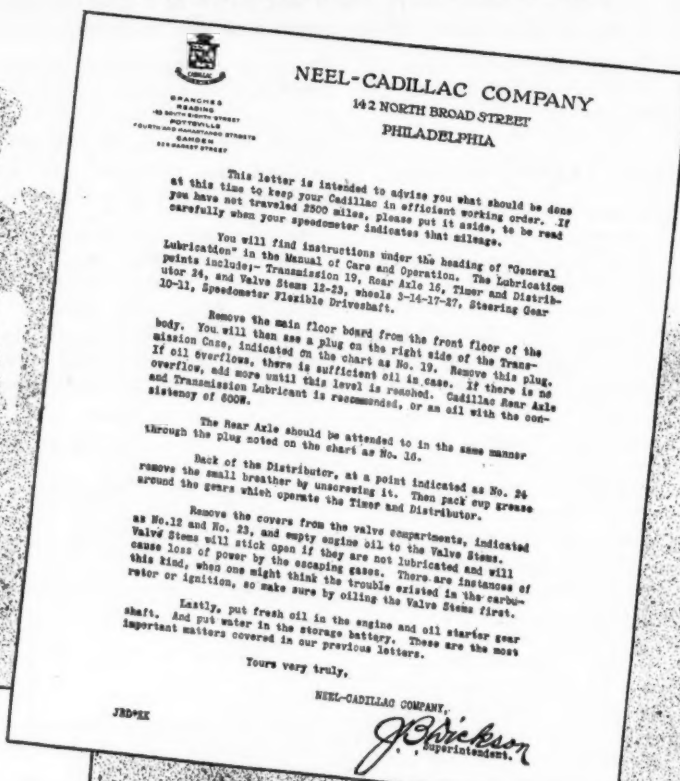
Use the Instruction Book to Cut Down Your "Free Service" Losses

ONE way for the dealer to put his service on a better basis of operation is to make sure that his customers make frequent use of their instruction books; which procedure very often makes it unnecessary for a trip to the service station on a trivial matter.

Instead of putting an instruction book in the tool kit of a new car delivered to its owner, the Neel-Cadillac Co., Philadelphia, mails its instruction books to owners together with an introductory letter, after which the recipient of the book gets seven more letters at stated intervals. Letter No. 2 goes out two weeks after the car is delivered; letter 3, one month later; number 4, two months later; number 5, three months; number 6, four months; number 7, six months, and letter 8, one year after the car was purchased.

These letters contain information which enables the owners to keep their cars in the best of condition. The average car owner pays little attention to the statements made by the manufacturer in his instruction book relative to when and where to lubricate. But, when the car owner gets a letter calling his attention to the fact that his car has traveled so many miles and it is time for him to make certain adjustments, he is pretty sure either to do it, or take the car to the service station for the work to be done there.

Herewith we reproduce some of the letters sent out by the Neel-Cadillac Co. Letter No. 1 is now shown, but it tells the new owner to immediately read the chapters on "Driving and Caring for the Car," "Starting the Engine and Shifting the Gears, Care of the Finish and Lubrication."





No one need be told in this day and age that better work can be accomplished when the light is good. Especially does this apply to service stations and repair shops. Above are shown two views taken in the service station of the Maxwell-Chalmers dealer at Hartford, Conn., and the abundance of light will readily be appreciated. The full length skylight makes possible the entrance of considerable light which is supple-

mented by the windows and doors. As a tip many of our service stations and shops might well wash their windows at stated periods. There seems to be quite a tendency for neglect in this respect and not only does it make it harder for the workmen, but a service station with dirty windows looks anything but inviting to customers, who often judge the class of workmanship to be of the same character as the environment

Cleaning Cars by Air and Water

With the Hand Method It Took About Thirty Hours to Clean a Car After It Had Been Driven In from the Factory, But Only One Hour Is Now Required

CLEANING motor cars by air and water is the newest idea of Frank R. Tate, President of the Tate-Gillham Motor Car Co., Dodge distributors in St. Louis. Mr. Tate is confident the idea, which he has proved practicable, is worth a million dollars to the motor car trade of the country.

To a representative of *MOTOR AGE* Mr. Tate said:

Cleaning cars by hand has ever been a thorn in the side of the dealer and it was after we had driven about seventy-five Dodge cars from the Detroit factory to St. Louis last winter that we hit upon a labor-saving, money-saving plan for putting cars in shape after they had reached destination.

Hand Cleaning Took Thirty Hours

The distance from Detroit to St. Louis, by county roads, ranges from 650 to 750 miles and we found in driving our cars through Illinois, the gumbo that you meet up with on the road gives the cars a most unsightly appearance when they reach St. Louis, and as a result they had to be thoroughly cleansed, inside and out, and this work, under the old hand system, required about thirty hours of labor on each car.

That was too much time and too much labor lost. We determined that there must be a way out. After studying various plans we decided that air and water propelled through a $\frac{3}{4}$ -in. nozzle would do the work, and the tests began.

A 4-ft. rack was constructed—a rack

somewhat resembling the dry dock on which they place ocean-going vessels—and on this we placed the car to be cleaned. We installed a small air-compressing plant, but later sold this and installed a much larger plant. The nozzle which we use is 3-ft. in length and after various experiments we found that a 100-lb. air pressure combined with the normal power of city water pressure did the work.

Now Done in One Hour

With the car on the rack, a man can get under and over the machine, and the combined air and water pressure, conveyed through the $\frac{3}{4}$ -in. nozzle, not only cleans thoroughly every part of a machine, but the work can be done within an hour, whereas by the old hand method the time employed was about thirty hours.

The water, of course, releases the mud and gumbo and the air pressure removes the last particle of grime from every part of the car. After the dirt has been removed the water pressure is checked and we use only the air, this as a drying process which has worked wonderfully well. The use of chammois skins is not required and in consequence the air drying doesn't leave a single scratch or blemish of any kind on the surface as so often happened with hand work.

There are other advantages in the new system that shouldn't be overlooked by motor car men. For instance, by the hand system it required from three to

five hours to clean a radiator. By the air method we can clean a radiator in less than two minutes, and the engine in five minutes.

We don't want readers to think that we didn't have our own troubles before we reached a stage of perfection in the operation of the new plan. One of the things we early discovered was that little air and high water pressure knocks the paint off, so we had to use all sorts of pressure, high and low, before we finally hit the mark. We found finally that the normal city water pressure, backed up by a 100-lb. air pressure did the work in a most satisfactory manner.

Among the advantages of the air-cleaning plan as enumerated by Mr. Tate are these:

Will Save Vast Floor Space

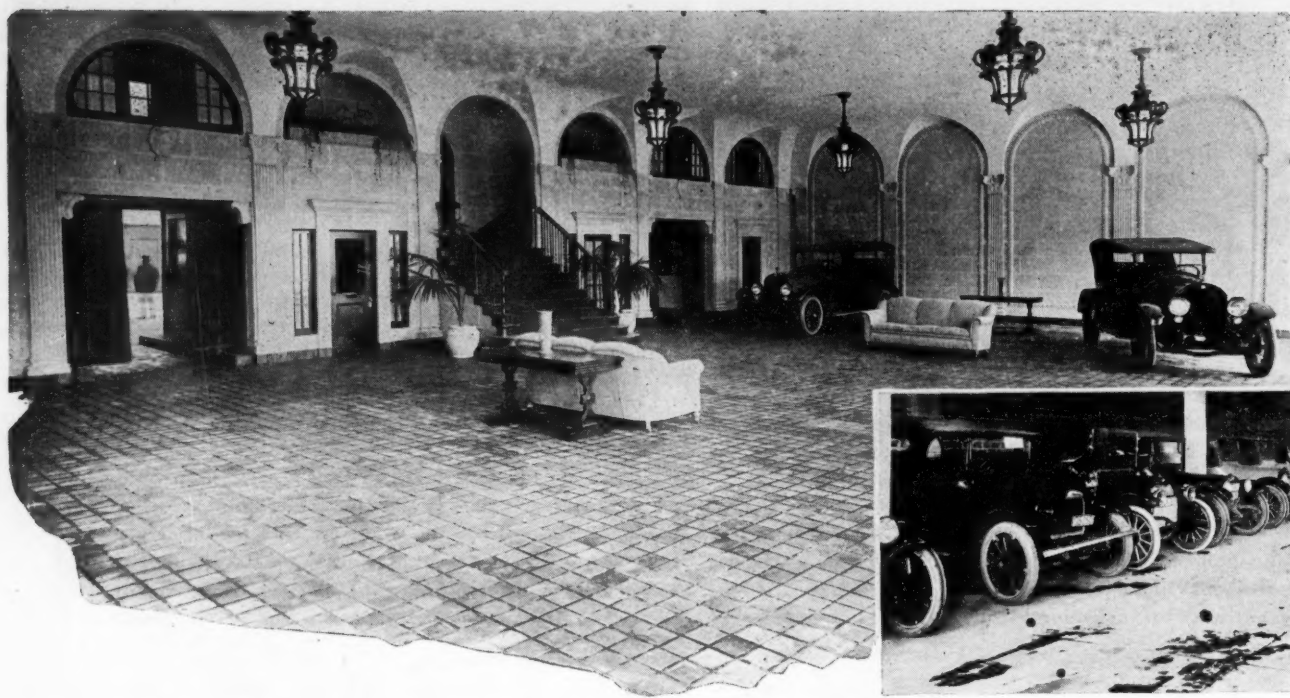
A firm having forty or fifty jobs a month not only saves time and labor, but there is a vast amount of floor space saved as well, and deliveries are made more quickly.

For example, under the new plan, a customer doesn't have to wait two or three days for the delivery of a new car while he is awaiting for it to be cleaned by hand, instead it is cleaned within an hour and in the majority of cases is delivered to purchaser on the same day that it comes from the factory.

Thus, the dealer can estimate that through quick delivery he is actually saving from 10,000 to 30,000 ft. of floor

(Concluded on page 28)

Are Your Used Cars Selling?



Instead of burying your used cars on the second or third floor where the gloomy surroundings dampen the spirits of the prospective owner, why not overhaul, paint and give them some of the prominence the new cars get on the salesroom floor? The above illustration tells the story

IN WHICH department of the average automobile sales agency or branch establishment would one look for the most difficult problems having to do with service?

The dealer, lying awake nights, realizes that the service problem is tough enough, viewed from any angle and is not anxious to tempt fate by looking for the meanest angle. It is service on that necessary evil—the used car.

With the foregoing thought in mind it will interest the dealer and the branch manager to learn how the used car service problem is being met and a liability converted into an asset through the working out of the "Marmon Idea" by The Marmon Chicago Co. distributors of the Marmon and Hupmobile.

Mr. E. L. Cummins, manager of the used car department of the concern is authority for the statement that the first step in combatting the used car service problem is taken before the car is offered for sale. This consists of a very careful and comprehensive check-up of mechanical, tire, paint and other conditions, top, side curtains, upholstery, tool equipment, etc. Invariably it is found necessary to put the car through a practically complete rebuilding operation costing from \$700 to \$1000 before it is considered that it is in fit salable condition, which, in this case, means serviceable condition.

Be it understood that the operation is not merely one of overhauling, as this

One of the chief reasons why used cars become liabilities rather than assets is because there is not the same energy and thoroughness put behind them in sales and service as with a new car. Your used car salesmen should come from the service ranks, because, being conversant with service problems, he will be slow to make rash promises merely to close a sale.

term is generally understood. It is a complete rebuilding operation and necessitates the replacement of all the important wearing parts and nearly all other parts not, as a rule, considered vital or important, spring shackle and body bolts, for instance.

This disposes of step number one of the service problem by forestalling trouble before it starts. It will be agreed that this method should go a long way in eliminating the most difficult phases of the service situation.

Requirements of Used Car Salesmen

Factor number two—the sales force. Here is another, if not the most important link in the chain. This organization is distinct from that of selling new cars. The training of the individuals has been along distinctly different lines. In the new car sales force the individuals have been selected for their specialized knowledge of the art of making sales. Their knowledge of mechanical and engineering problems is of negligible importance. In fact, such knowledge is usually a detriment.

In the used car department this is not true. Every salesman in this depart-

ment is a graduate from the ranks having spent a long apprenticeship in the service shop and other parts of the organization. He is a thorough mechanic with a wholesome respect for the service problem as viewed from the service manager's, shop foreman's and mechanics' angle. This special knowledge makes him wary of making rash promises. This last sentence will be repeated further along in this article. It could, with great profit, be repeated several times until the value of the suggestion is driven home.

The foregoing facts exercise a powerful influence in two directions, both of which make for a high standard of service. First, every mechanic in the used car department—which, by the way, is separate from and independent of the new car service department—understands that he is in direct line for promotion to the used car sales department. This makes for loyalty and conscientious effort on the part of the mechanic. Second, the salesman having graduated from the service department is thoroughly conversant with service problems and is, therefore, very slow in making rash promises merely to assist in closing a sale. He makes no statements he is not authorized to make and which would prove a boomerang later and a source of chagrin and perplexity to the service manager.

A thorough understanding of and adherence to the two foregoing plans con-

stitutes more than half of the solution of the used car service problem. Adherence to the last mentioned rule would prove of value in many car sales organizations dealing either in new or used cars or commercial vehicles. Wild promises have made many enemies for the dealer who permits his salesmen to indulge in the practice or who slyly chuckles in his sleeve and mistakes sharp practice for cleverness and immediate profits for ultimate success.

Consider now the general atmosphere pervading the establishment under consideration, and the mental attitude carefully inculcated in the used car purchaser, both before and after the sale. These factors may, at first glance, appear foreign to the subject under discussion, but upon careful consideration their relativity will be discerned.

The prospect is directed to the used car sales department by conspicuous, though neat and unobtrusive, signs. He is tactfully relieved of the necessity of making inquiry of a new car salesman or any person in the new car department. In fact, he need not set foot in this department. Upon reaching the used car department, which in appointments is in keeping with the rest of the establishment, he is met by a courteous, attentive, salesman.

The real education now begins. He is made to feel that he is doing something more than buying a used car. In fact, the used car suggestion is studiously avoided. Instead, the suggestion is given, with diplomacy and subtlety, that the prospect is establishing business relations with a business concern. The volume and value of his purchase are of secondary importance. He is spoken to as one business man would talk to another with the idea of winning a future patron rather than consummating an immediate sale. The idea that many future deals will be transacted is driven home to the mind of the prospect. The effect of this bit of psychology is to raise the prospect in his own estimation.

Dignity of Purchaser Upheld

Especially is this true if he has been "shopping around" and come in contact with that atmosphere which suggests inferiority; an atmosphere which is much too prevalent in the average used car salesroom. The prospect is, almost instantly, changed from a mental attitude of half apology for having to descend to a used car to a feeling of self-respect. The seed of courtesy and understanding immediately bears fruit and the salesman and establishment have won a friend and in most cases, a patron.

The sale will now be considered as consummated. The salesman has made no wild promises. He has called the prospect's attention to the splendid finish of the car. He has pointed out that all the bright parts have been carefully replated and that everything which might indicate that the car had been used had been replaced with a new part. He has capitalized the prospect self-respect. He dwells at length on the wonderful rebuilding process through which the car has passed. When, in his judgment, the

prospect is ready to consummate the deal, and not until then, does he mention service.

Now what is this wonderful service story? Simply this: The car is covered by a warranty against defective material and workmanship for a period of ninety days. Any failure which may be caused by a defective factor will be made good free of charge within the meaning of the warranty. Free service: Here comes the ticklish point. The term "free service" is avoided and in its place the terms "free inspection service" or "free inspection" are used. This service is

ONE way to successfully sell used cars is to make your prospect feel he is buying more than merely a used car. Rather, he must be made to feel that he is establishing business relations with a business concern. The volume and value of his purchase must be of secondary importance. By having put the used car in good condition and with the ability to give efficient service on it, the dealer has won a friend who will some day come back for a new car and the service that is sold with it.

given for a period of thirty days. That which shall constitute free service, within the meaning of the warranty, is interpreted, not by the salesman, not by a shop foreman, not even by a service manager, but by the man highest up, the department manager and the customer in quiet friendly discussion in a quiet, well appointed private office, and not on the salesroom floor.

Complaints Handled Diplomatically

Now see again how psychology wins. The customer is made to feel that his opinions are of importance to the concern. He is not turned over to an underling to be browbeaten, cajoled or tricked as the exigencies of the case may dictate. He is ushered into the presence of the highest in authority. He is welcomed and his claims for service listened to, analyzed and measured with the terms of the warranty as the yard stick. A liberal interpretation of these terms is the rule. If the customer's demands are unreasonable, such unreasonableness is pointed out, diplomatically and not brusquely. In short, he is made to feel that he is in the presence of a gentleman and a friend.

Another point of value is that the customer is never allowed to start an argument with a salesman or mechanic. Although there is none of that chilly, "I have sold you a car. Good-bye and good luck," atmosphere, neither is the feeling of belligerence or controversy allowed to take root. Diplomacy is the watchword and the customer quickly finds himself seated in a comfortable chair, in the presence of the department manager discussing things in a cool, unimpassioned manner and reaching an agreement satisfactory to all concerned.

This all reads like hallucination of some impractical dreamer. The practicability of the ideas could be justly chal-

lenged and questioned were it not for the fact that it has been demonstrated to be wonderfully efficient for the past several months. These and some others to follow, are the ideas underlying the now nationally advertised "Marmon Idea". To the credit of The Marmon Chicago Co., be it known that the ideas were conceived and the systems worked out by the heads of this concern and that they have been adopted by the factory organization and are rapidly being put into operation in every Marmon agency and branch establishment in the country.

Next in order comes the actual service work, how and where it is done, how it is checked and charged for. First for consideration is the dual service inspection report and repair order shown in Fig. 1. The findings of an expert inspector are filled in on this sheet and turned in to the department manager for his O. K. Many times there are small items noted by the inspector which have escaped the notice of the owner. It is part of the department manager's duty to call these to the owner's attention and strongly urge that the additional work be done. Here enters the element of salesmanship and, for the time being, the department manager assumes another role and becomes a service sales manager. The department manager has two powerful levers with which to influence the judgment of the owner. One is that by remedying the small trifles as they occur prevents their growing into expensive troubles later, and the other is that if the car is kept in top notch condition by proper attention at the right times the deterioration will not be so great. Or, to put this latter in the positive way, the resale value will be greater.

The owner is presented with the confirmation shown in Fig. 2. The form shown at Fig. 3 goes to the accounting department for billing and is held until the record of the completion of the job is turned in. The tracer's copy shown in Fig. 4 is very important as by means of it the service manager is enabled to keep a close check on the progress of the job and, if through some unforeseen circumstance, the car cannot be delivered at the time promised, the service manager can advise the department manager who in turn notifies the owner, thus forestalling those most aggravating last minute disappointments.

Every Department Kept Informed

The timekeeper's copy, shown at Fig. 5 will, it is believed, be well understood and will need no explanation. The form shown in Fig. 6 is printed on medium weight manilla card. It is placed in a celluloid faced envelope container and goes with the car through all operations. As each is completed it is checked off. Upon completion of the work, the shop copy is turned in to the accounting department. As the subject matter on each form is the exact duplicate of that on every other form, the shop card must, of necessity, tally with the billing department copy. Additions or erasures are not allowed. All changes from the original order are noted on the form next to be described. Evidence of much thought is shown by the little form marked Addi-

The System Used In the Marmon Chicago Service Station Which Keeps All Departments Informed As To What Is Being Done On Every Repair Job

Fig. 1

Form No. 31

CONFIRMATION OF REPAIR ORDER

MARMON CHICAGO COMPANY
2341 WABASH AVENUE
PHONE CALUMET 5800

ORDER No. _____

TAKEN BY _____

CHARGE TO _____

ADDRESS _____

CAR NUMBER _____ DATE SOLD _____ MILEAGE _____ GASOLINE REGISTER _____ DATE CAR REC'D. _____ PROMISED FOR _____

Fig. 2

FORM 21-A 10M 8-10 4086

REPAIR ORDER

THE MARMON CHICAGO COMPANY

No. _____

CHARGE TO _____ PHONE No. _____

ADDRESS _____

CAR NUMBER _____ DATE _____ MILEAGE _____ GASOLINE REGISTER _____ DATE CAR REC'D _____ PROMISED FOR _____

AGREED PRICE _____

3RD FLOOR _____ 2ND FLOOR _____ 1ST FLOOR _____ PAINT AND TRIM _____

IT IS UNDERSTOOD BY THE ACCEPTOR OF THIS ORDER THAT: (A) ESTIMATES DO NOT INCLUDE OIL, GREASE, GASOLINE OR BATTERY RENTALS. (B) THE COMPANY IS NOT LIABLE FOR LOSS OR DAMAGE BY FIRE, THEFT OR ANY OTHER CAUSE, NOT DUE TO COMPANY'S NEGLIGENCE. (C) COMPANY IS NOT RESPONSIBLE FOR SWITCH KEYS LEFT IN CARS. (D) OWNER WILL BE NOTIFIED WHEN WORK IS COMPLETED AND STORAGE CHARGES WILL ACCRUE AT REGULAR RATES UNTIL CAR IS TAKEN OUT.

ORDER TAKEN BY _____ ACCEPTED _____

FOR MARMON CHICAGO COMPANY _____ OWNER _____

By _____ HIS AGENT _____

Fig. 3

IT IS UNDERSTOOD BY THE ACCEPTOR OF THIS ORDER THAT: (A) ESTIMATES DO NOT INCLUDE OIL, GREASE, GASOLINE OR BATTERY RENTALS. (B) THE COMPANY IS NOT LIABLE FOR LOSS OR DAMAGE BY FIRE, THEFT OR ANY OTHER CAUSE, NOT DUE TO COMPANY'S NEGLIGENCE. (C) COMPANY IS NOT RESPONSIBLE FOR SWITCH KEYS LEFT IN CARS. (D) OWNER WILL BE NOTIFIED WHEN WORK IS COMPLETED AND STORAGE CHARGES WILL ACCRUE AT REGULAR RATES UNTIL CAR IS TAKEN OUT.

IF ABOVE IS NOT IN ACCORDANCE WITH YOUR UNDERSTANDING, PLEASE CALL BY PHONE AND ASK FOR MR. _____

Fig. 4

Form No. 32 10M 8-10

ADDITIONAL ORDER

No. _____

Name _____ S. O. No. _____

Date _____

Fig. 5

CAR DELIVERED _____

TRACER _____

Fig. 6

Timekeeper _____

INSPECTED, INSPECTED, AND APPROVED FOR DELIVERY _____

NOTE EXCEPTIONS FULLY ON BACK HEREOF _____

Inspector _____

Fig. 7

Form No. 32 10M 8-10

ADDITIONAL ORDER

No. _____

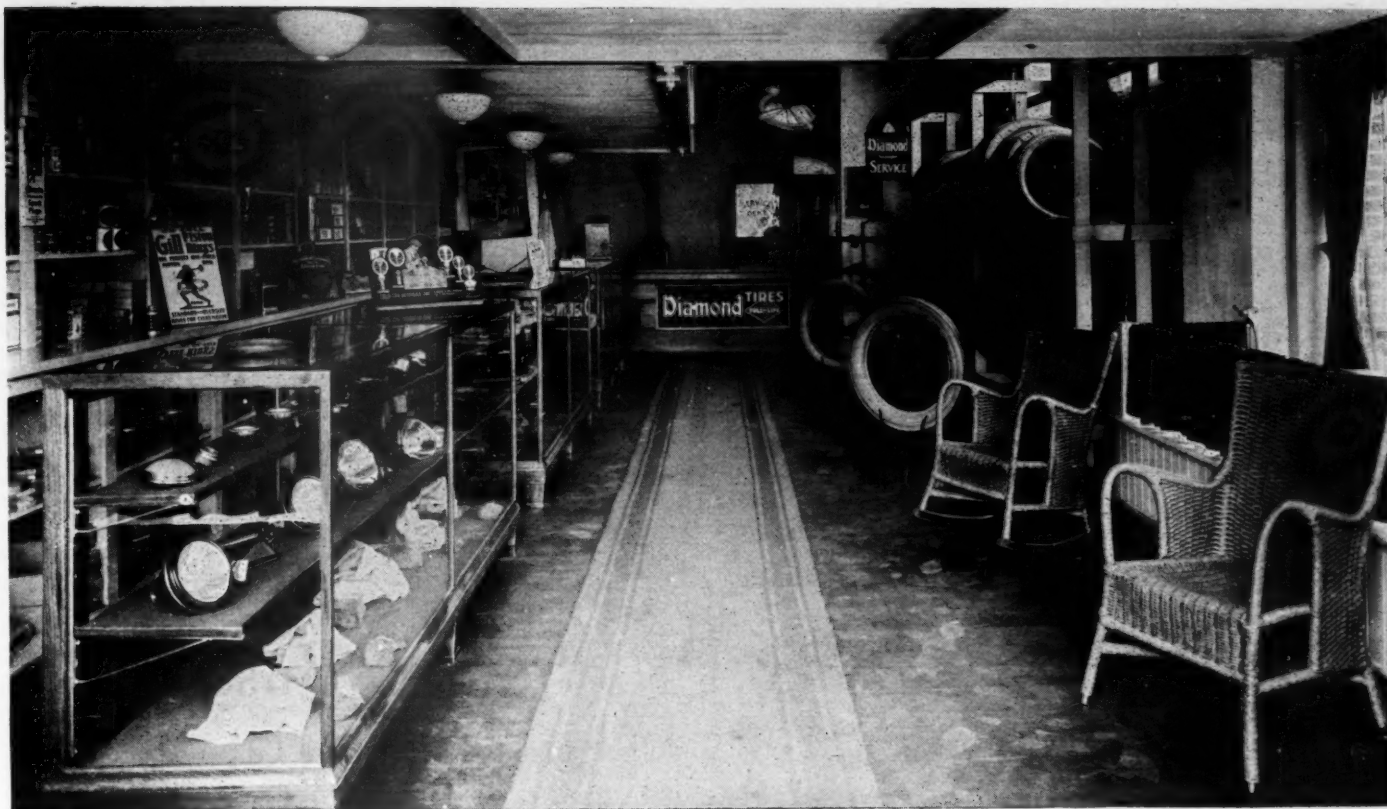
Name _____ S. O. No. _____

Date _____

tional order, shown in Fig. 7. This little form, probably, does more to prevent arguments and ill feeling than any of the others. It might be called an emergency form, as it is designed to care for those unforeseen contingencies which arise in nearly every repair operation. When the unexpected is encountered and it is realized that the magnitude and cost of the

job has been increased thereby, the owner is notified immediately and an expression of his wishes obtained. Now, ordinarily, this additional order would be transmitted, verbally, to the service manager or shop foreman with an excellent chance of being forgotten, or would, perhaps, be written on one or more of the main forms.

Neither of these two slipshod methods are allowed in the Marmon organization. A six fold copy of the Additional Order is made out, the same as is done with the original order. One of these is given to each of the departments and one mailed to the owner. Again all chance of misunderstanding and acrimonious argument is avoided—system does it.



The Carew accessory store in Seattle, Wash. Comfortable wicker chairs are provided for customers who may have to wait a few minutes. Magazines are available for those who wish to read. Note the simple and attractive display of devices in the showcase. The whole establishment radiates cleanliness and business efficiency

Giving Service to Sell Accessories

When the Gasoline Shortage Hit the Pacific Coast This Dealer Capitalized It To Bring In New Customers and He Does Other Little Things of Service Which Make Them Permanent Patrons

WHEN the gasoline shortage arrived on the Pacific Coast at the very beginning of the spring motoring season and caused an enforced curtailment of the use of automobiles and which still exists in a less marked degree, many motor accessory dealers permitted themselves to become enshrouded in gloom.

While there is no justice in swishing aside the fact that the gasoline shortage placed accessory dealers as well as all sections of the retail automotive trade on the west coast in a most unfavorable position, many dealers were able to see good in evil and started out to capitalize on the situation that developed. Among these are Mr. and Mrs. J. T. Carew, of Seattle, Wash.

Carew, with his hard-hitting merchandising lifemate, Mrs. Carew, have been engaged in the accessory business in Seattle for less than a year. Until the gasoline shortage came on, their business has not been very successful. They had plunged into a line of business in which neither was familiar but they plunged with determination, enthusiasm and optimism. They studied their business from all angles. They studied every

There are a number of valuable hints in this article on how to increase your accessory sales. They have proved their worth in building up Carew's business; they will do the same for you if put into practice. The things that make car owners glad to buy from Carew will be just as effective in your community.

article of goods they handled as a school-boy would study his textbooks. At the outset they acquired a complete stock and they arranged their stock on the shelves and in the display counters in a very attractive manner. In the interior arrangement of the establishment, Mrs. Carew held the directing hand and she caused to be created an inviting atmosphere that justifies the store's slogan, "The Store Distinctive."

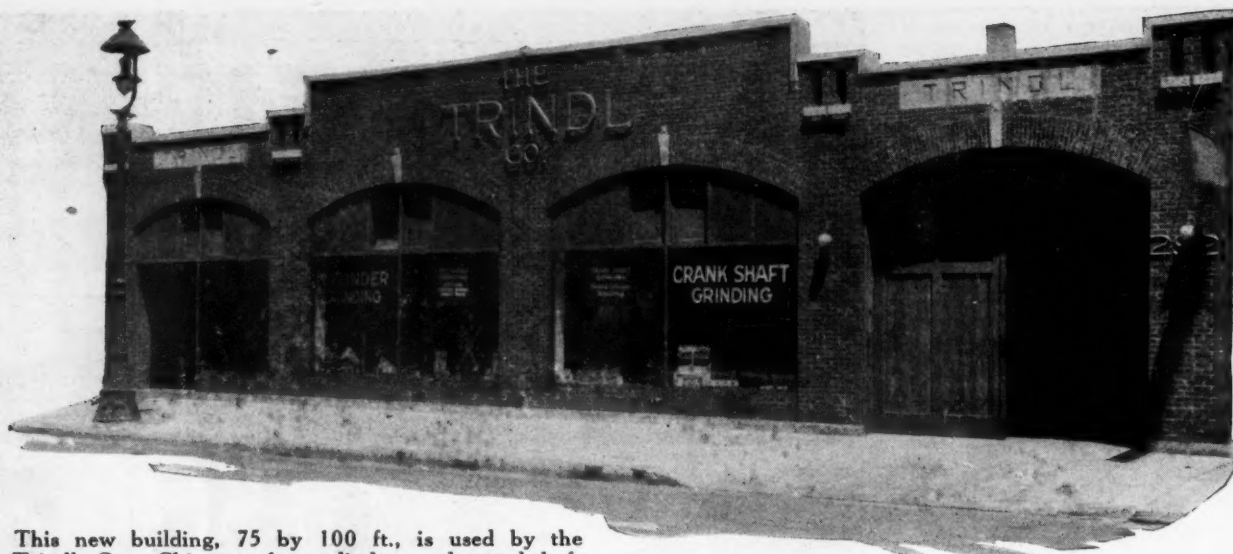
The store was made to radiate cleanliness and business efficiency. Comfortable wicker chairs were provided for customers who may have to wait their turn while the Carews are engaged with others. Magazines are available to read.

Solely for the convenience of the trade, a cigar stand was installed and a small stock, but embracing a wide variety, of tobacco, cigars and cigarettes was provided. The displays in the street show windows were arranged with the combined fastidiousness of a woman and the business acumen of a man.

When the gasoline situation developed, Mr. and Mrs. Carew looked the situation squarely in the face. They regarded it from its unfavorable and then from its favorable aspect. They sized up their own business as it was being affected and they made the rounds of the city and saw how the business of their thousand and one competitors was being affected.

The establishment operated by the Carews is not located on or near automobile row in Seattle. It occupies a position in a comparatively new district near the outskirts of the northern limits of the business district. While thousands of automobiles pass the shop every day, the location has never been one in which motorists were accustomed to come for their accessories, gasoline, oil and other supplies, unless they were

(Concluded on page 28.)



This new building, 75 by 100 ft., is used by the Trindl Co., Chicago, for cylinder and crankshaft grinding, piston and piston pin work

Service On a Production Basis

Regrinding Work on a Large Scale Has Enabled The Trindl Co., Chicago, To Become a Vital Factor In the Dealer's Service Station

BY putting its service on a production basis, the Trindl Co., 2917-21 Wabash Ave., Chicago, has put itself into a position to render service on cylinder grinding, piston, rings, piston pins and crankshaft work superior to that afforded by the equipment possible in the average dealer's service station.

The mode of operation in the Trindl plant is such that the institution and equipment becomes in reality a part of the dealer's service. The concern has a line of steady customers from all over the country with the result that a twenty-four hour day is necessary, with a total of 110 employed. On an average, something like 3,000 cylinders are ground monthly. Six Heald grinders are on the job constantly.

While cylinder grinding forms the major part of the business, the concern does a vast business on manufacturing and fitting pistons, including also the rings and piston pins. Along this line it might be stated that the Trindl Co. at present is making piston pins for many of the large engine and car builders, in addition to manufacturing other automotive parts. Thus, it will be seen that the concern enjoys the reputation of doing both a service and manufacturing business.

Inspection Thorough

Recently the Trindl Co. moved into a new building, 75 by 200 ft., and are equipped with modern machinery and methods for volume work. The inspection methods are very thorough and a glance at the company's record sheets show that invariably where a job is sent back it is because of improper lining up of the connecting rods or from having neglected to treat a reground set of cyl-

inders and new pistons as a new engine, with a resultant scoring of the bores.

From past experience the Trindl Co. knows that the average car owner is reluctant to leave their car at a service station for a job of cylinder regrinding because they have been led to believe that this will tie up their cars for too long a period. To meet this condition the Trindl Co. has impressed upon its dealer customers and others engaged in the automotive repair business that this organization can take on any volume of regrinding work and assure quick delivery.

Must Have Proper Equipment

Thus it has been possible in the past for dealers to impress this on their customers and build a reputation for good work. There is nothing quite so distressing as to attempt a job of truing up

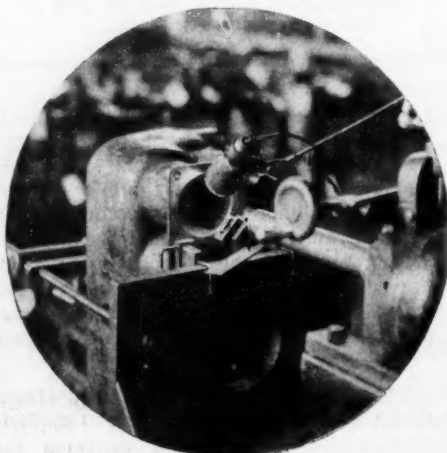
cylinders and fitting pistons in a shop that is not properly equipped for this class of work. It is one of the things that has given service stations a black eye, because the average car owner does not know what equipment is necessary for work of this kind and is led to believe that his engine is being taken care of properly, when, as a matter of fact, a few hundred miles running reveals the true nature of the work that has been done.

Few of our shops connected with dealer's service stations are equipped to do crankshaft grinding, nor could they afford the necessary equipment, yet one often finds a mechanic attempting by crude methods to true up a crankpin bearing that has been worn oval, with but partial success. It is these sort of jobs that lead to customers coming in with their cars the second and third time and is largely responsible for losses in service work.

Record Kept of Each Job

To offset such conditions and to enable dealers and service stations to render service that stays sold, the Trindl Co. has made itself in reality a part of the service station of a good many dealers. Such service stations and dealers frequently send connecting rods, etc., along with other parts to the Trindl Co. for the purpose of having the latter concern fit them accurately and thereby relieve themselves of much time and trouble, having then only to do the assembly work in their service stations when the parts come back.

One of the features of Trindl service is the history that is kept of each job. The concern can go back several years and tell exactly from the history card of



Close up of the machine with which scored cylinders are repaired

any job just how much a certain set of cylinders were ground out, what pistons were fitted, and any other work done at that time. Consequently, when the same set of cylinders may be shipped in at a future date all the necessary data is available, whether the customer is so informed or not.

The parts and stock department of the Trindl Co., as the illustration herewith will show, is kept up to capacity at all times so that the company can supply pistons and pins of every description, standard and oversize, or even special on short notice. The concern carries in stock finished pistons, and semi-finished pistons, piston casings and patterns for nearly every make of car, gasoline engine, motorcycle, tractor, etc. The company makes only iron pistons, excepting when a customer wants alloy pistons.

Many dealers have found it advantageous to send to the Trindl Co. for pistons, because very often the uncertainty of factory supply means tying up the car indefinitely waiting for parts.

Repair Scored Cylinders

The scored cylinder repair department has proven a profitable business venture and the patented copper-alloy process used by the Trindl Co. has reclaimed many a cylinder which otherwise would have been junked. This process has rounded out the line of cylinder work, so that the concern is in position to handle all sorts of repair work. A badly scored cylinder must be repaired before it can be reground and inasmuch as many cylinders are received in a scored condition, the concern saw fit to add this class of repair work and began regrinding on a large scale.

The Trindl Co. was started three and one-half years ago by J. H. Trindl, who before that time was conducting an automobile repair shop. Some idea of the present growth of the concern may be gathered from the fact that the new plant is already working to capacity to meet the requirements of its customers.

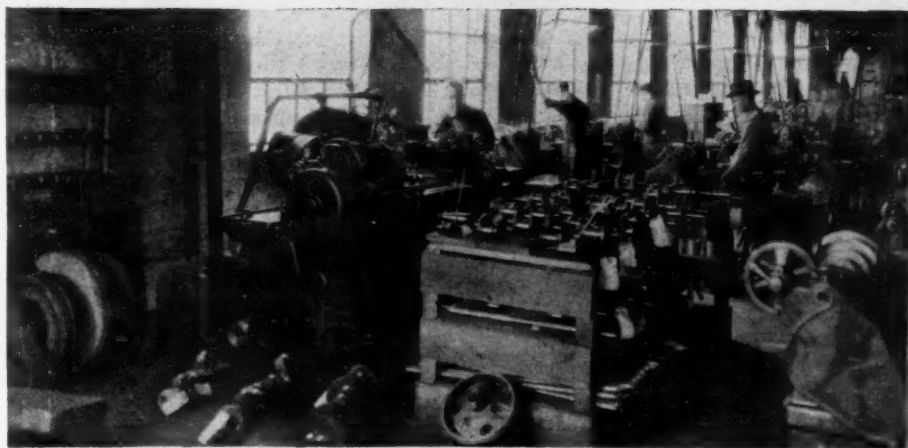
To give the dealer an idea of about how much the average job costs, we quote a few of the prices for typical jobs:

Grinding one cylinder of an engine of 4 in. bore would cost about \$3. To grind cylinder, make and fit piston and rings for a single cylinder, 4 in. bore, \$18; two cylinders, \$29.50; four, \$55; six, \$68.

Repairing a scored cylinder usually runs about \$9.50 up to and including 4 in. bore; over 4 in. about \$10.50.

KNOW WHERE YOUR BUSINESS STANDS

Don't wait until you are face to face with a crisis to start looking for the department that has been running inefficiently and eating the profits—it may be too late! Make a chart of your records and you will know at a glance where you are making money and where losses must be checked. The article on page 7 will give you some good ideas for making these charts.



Four views taken in the Trindl plant. Top to bottom, part of the piston stock, crankshaft grinding department, scored cylinder repair department and completed jobs ready for shipment



EDITORIAL



YOUR BUSINESS IN THE FUTURE

EVERY motor car dealer might as well make up his mind to the fact that before so very long we shall have to sell cars, not merely take orders for them and deliver them whenever they can be obtained.

The era of intensive merchandising lies before us and those dealers who are going to be numbered among the preferred class will be those who in the past have been and are now laying plans for future business. The present credit situation has had the effect of "weeding out" undesirable characters in the automotive industry and in that has accomplished much good.

Some reliable dealers have been discriminated against, to be sure, but after all the charges when sifted have not been so severe as predicted at first. The legitimate dealer who can go to his banker with a clear conscience and lay down his cards, will get paper rediscounted. It's purely a matter of how good a business man he is.

Those dealers who expect to stay in business must start now to build up their service organization, because in the future cars or trucks and tractors for that matter are going to be sold from the rear door. That is, service is going to keep them sold.



A HOUSE BUILT ON SERVICE SURVIVES

PRODUCTION in the big automotive centers has fallen off. The depressed condition of the present is but a temporary halt in the upward climb of this great industry, which is now the nation's third. The dealer is this industry's

point of contact with the car buying public, so it is only natural that when production takes a temporary hitch in its trousers, the dealer must wait until the hitch is completed.

Those dealers whose main efforts have been directed at the building up of a large merchandising organization will be particularly affected by any temporary conditions such as exist at present. With a large number of cars out in the territory, the prospective purchasers will gain an excellent inside view of the way service is rendered by any particular make of car. The institution where service is regarded as the evil which tags along will stamp an indelible impression on the minds of these future customers. When their neighbors speak in praiseworthy phrases of the service they receive, a feeling is created that makes the hearer want similar service when he buys his car. Generally he will profit by the other's experience. It is, therefore, easily appreciated that service built up with merchandising creates future business.

Then on another important angle which confronts all dealers when production slows up slightly is the forming of ways and means to bolster up the credit side of the column when car sales lag. Accessory sales help, but service can be made to produce returns as large as may be desired, being limited only by the size and system employed in the shop.

We know of several establishments where the size of the service department seems all out of proportion to the size of the territory handled by the dealer. Yet every square foot of space is utilized. The answer is that these large institutions, prepared to render service, get their business from all the surrounding country. With these concerns, the revenue from their service work pays the big dividends. Which all illustrates the point that a house built on service will not fall, but will prosper even in times of stress.



SELLING USED CARS INTELLIGENTLY

THE question of how to handle used cars is one that has perplexed many dealers and is one that becomes more and more acute as the production of new cars goes on. Some dealers are handling their used car business successfully through approved methods; methods which are not far distant from those that characterize the sale and service incident to a new car.

Just as long as automobiles are built there will be people who want to buy used cars. Furthermore, for a long time to come the automobile dealer probably will have to consider trade-ins, and therefore, it seems logical to conclude that the matter of disposing of the used car is going to be with us for a long time. Most car owners are content with the dealer's proposition on a trade-in rather than try to dispose of their cars themselves, which is another factor that largely will be responsible for dealers having a number of used cars on their floors most of the time.

Right now used cars are bringing comparatively high prices. But the time is coming when a good many dealers probably will have all the new cars they want on their floors and in store rooms and when this period comes the used car question is bound to produce complications unless the dealer has been wise enough to prepare for it.

The used car taken in trade for a new one should not be looked upon as so much junk and thereby become a liability. It is this order of things that has caused some banks to discriminate against certain dealers, the banks holding that these cars are not assets.

Too few dealers have considered properly the service work on a used car. The first job after a car has been taken in, is to give it a complete overhauling, especially if it is an earlier model of the make of car the dealer is handling. If the car is of the same make, whoever he sells the car to must be made to realize that he is establishing a business relation with the dealer. Too many salesmen lose their enthusiasm when a prospect comes in and talks used cars, and too many dealers make the mistake of burying their used cars, when perhaps their salesroom floor is empty of new cars.

The customer who buys a rebuilt used car and gets good service from the dealer is pretty sure to be a prospect for a new car some day. But, if he buys a used car in poor shape from a dealer who wants to get such a car off his hands, he will look somewhere else when he is in the market for a new car later on.

Crop Movement Tightens Credit

Reserve Banks In Agricultural Sections Must Call on Other Districts for Help—
Complications Due to Fact that Much of Last Year's Crop Is Still Warehoused

DALLAS, Aug. 9—The credit situation in the Dallas district is intrinsically sound but many elements have combined to place a severe strain on credit. Inability to dispose of low grade cotton and the virtual freight embargo in many sections has slowed up liquidation. The unusual cost of planting the present crop, because of the high prices of labor and the necessity for replanting in many places, has added to the credit burden. The fact that there has been no real market for wool and mohair has, to some extent, embarrassed banks in western Texas and in New Mexico.

This situation is offset, however, that in the district, ready for shipment, are cotton, wool, mohair, wheat, cotton seed products and cattle, with a certain value of \$250,000,000. These will gradually be marketed and the railroad car supply is slowly improving.

Eliminate Speculative Loans

For months there has been a steady elimination of all speculative loans and credit has been limited to production uses. The loans of the Federal Reserve bank are heavy and are expected to increase for the next 30 days at least. It is rediscounting in substantial amounts with other Federal Reserve banks but not so heavily as last year.

Kansas City, Aug. 9—Estimates indicate that the Kansas City Federal Reserve bank may find it necessary to borrow as much as \$20,000,000 more from the other central banks before the peak of the crop moving demands is reached. This is \$10,000,000 less than was believed probable a few weeks ago, however. It already has borrowed \$19,000,000. To conserve credit for crop moving needs, the Kansas City bank still refuses to rediscount passenger automobile and other "luxury" paper. It is re-discounting motor truck and tractor paper, however.

The bank's estimates may be thrown entirely out of adjustment by the railroad situation. If the carriers supply enough cars the prospect for prompt liquidation will be much better than if the supply proves short. The outlook now is not encouraging and more cars are needed than are being received. Lack of cars also is hindering shipments of cattle and liquidation of cattle loans.

Minneapolis, Aug. 6—The Federal Reserve bank has sent out a letter indicating to banks that their chief business

THE inevitable tightening of credit in the great agricultural districts, in preparation for the peak of the crop moving season, has arrived. Reserve banks in these sections will have to call on other districts to help them handle the crop movement and the result will be a general tightening for another month at least. In ordinary years the situation would be only temporary, but it is complicated now by the fact that transportation difficulties make prompt crop movement impossible and that a considerable part of last year's crop remains in warehouses. This will result in "freezing" an enormous amount of credit which usually would be liquidated within thirty or sixty days after the harvests.

The railroads have reduced to less than 100,000 the accumulation of loaded cars, but there has been no material improvement in the situation except in widely scattered districts. Box cars are still flowing into the crop belts and open top cars to the mines.

now must be to see to the handling of the present old grain stocks and the new crop. The design is to cut out all speculative paper, which must be called in for liquidation. While there is no idea of hitting at the automobile trade the bank believes a lot of people are buying automobiles on notes and that this must be done away with also until crop is handled.

Farmers' Money Tied Up

Much of this paper for payment of cars is made by well to do farmers who have no money at hand, but will have when crop is sold. To the extent it cuts off this sort of business it will slow down the motor car trade appreciably in the country. However it is believed when the country banks begin to get in returns on crops and the farmer again has money they will be able to act independently of the reserve bank restrictions. A mighty fine business is expected as soon as the crop rolls in and the country has its own money.

Favors Truck Paper

New Orleans, La., Aug. 9—Apparently bankers who are members of the Federal Reserve Bank, especially those in the Southern district, of which Atlanta is the center, are to be left to their own discretion in the matter of making loans for the purchase of automobiles, if a letter recently received from M. B. Wellborn, governor of this district of the Federal Reserve Board, is to be taken as putting an end to the problem which has confronted automobile dealers in this section ever since Mr. Wellborn classified passenger automobiles as non-essentials.

The latest communication from the federal reserve district governor indicates that he is rather in favor of loans for the advancement of truck sales, and to enable the installation of motor truck transport lines in all parts of his district. He also favors aid to tractor selling, but insists that credits for financing the purchase of passenger automobiles be restricted.

Mr. Wellborn says:

"I think that, at this time, when transportation facilities are so badly crippled, we are doing a useful public service in continuing to grant credits for financing trucks and tractors. At present the credit situation is closely interwoven with transportation; commerce being tied up due to lack of transportation of necessary

goods. The false policy of the public for years past in regard to the common carrier injured them to the extent that their credit has been greatly impaired and the public is now suffering as the result of their treatment of the railroads.

Ask to Modify Ruling

Atlanta, Ga., Aug. 9—Calling upon the Federal Reserve Bank to modify or rescind its ruling curtailing automobile credit, and declaring that the action of the bank will prove detrimental to the best interests of all classes of industry, especially the farmers, Senator Shingler of the Tenth district of Georgia has introduced a resolution before the General Assembly.

If the resolution is favored by the state legislature, which is now in session, it will go forward to the authorities of the Federal Reserve Bank in this section with a request from the Georgia State Legislature that the Federal Reserve Bank either repeal its drastic curtailment ruling, or at least modify it to such an extent that the automobile business will not have to suffer.

AUTOMOBILE WORKS AT CHESTER

Philadelphia, Aug. 6.—Headed by James L. Morgan, of Overbrook, who has been associated with the Adair-Heyl Motors Co., Philadelphia, a new enterprise, to be known as the Morgan Manufacturing Co., and capitalized at \$3,000,000, will be located at Chester, Pa. A site for the erection of buildings to contain improved machinery for the manufacture of automobiles has been secured in the western section of Chester and operations to improve the tract will begin in a few days.

Four Cylinder Car to Be Put on Market By Gray Motors

Expected to Be Ready Within Six Months, the Cost Probably Being Less Than \$2,000

DETROIT, Aug. 7.—The Gray Motors Corp., which recently bought out the Gray Motor Co., of this city, will continue the manufacture of the Gray truck and tractor engine, and in addition will manufacture a four-cylinder car. The Gray Motors Corp., which is headed by Frank F. Beall, formerly vice-president of manufacturing of the Packard Motor Car Co., and reputed as one of the leading manufacturing authorities in the automotive industry, will introduce some novel methods in the shipment of its cars, shipping them in knocked-down condition to subsidiary assembly companies scattered throughout the distributing district. The subsidiary concerns will be partially owned and financed by the Gray Motors Corp., but will be independently operated.

Ten Cars Instead of Three

By this plan it is expected that ten cars can be shipped in the ordinary freight car, instead of the customary three. To suit this purpose, the car is

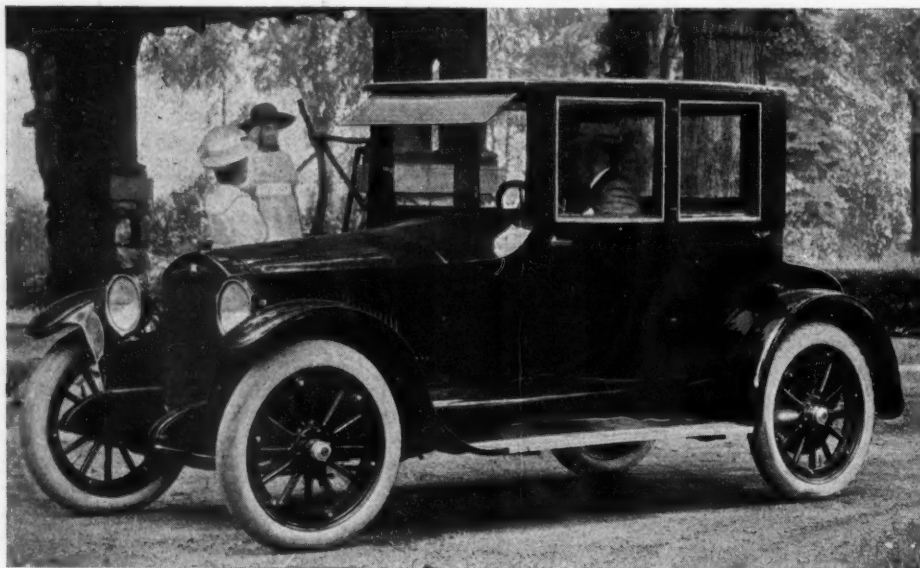
being designed particularly with the knocked-down shipment in mind, the body, for instance, being a special design which, it is stated, can be put together in less than one hour. The car is being designed by Benjamin Briscoe and Stahl, well known consulting engineers in Detroit, and is a further development of a French design recently completed by Benjamin Briscoe.

Production Expected in Six Months

A test car is now on the road and it is expected to be in production some time within the next five or six months. The car incorporates an improved design of the Gray engine with enclosed valves, pressure feed lubrication, longer connecting rods, lighter pistons and in general an advanced design as compared with the present Gray engine. The four cylinders block-cast are $3\frac{1}{2}$ by 5 in. The other parts of the chassis are composed of the products of prominent parts manufacturers including the Borg & Beck clutch, Thermoid Hardy universal, Muncie transmission and axles which are the manufacturer's own design.

The price of the car has not as yet been fixed, but it will probably be well under \$2000. It is intended to make a strong bid for export business with this product and it is anticipated that the knocked-down feature of the car will greatly assist in efficient crating and consequent saving on freight rates.

A VIEW OF THE NEW LIBERTY COUPE



The above photograph shows the straight-line effect of the new Liberty coupe

THE Liberty Motor Car Co., of Detroit, has put on the market a new model coupe mounted on its standard chassis. The new coupe is noteworthy for its practically straight lines, the top lines being much more symmetrical than in the preceding model. An improvement is in the use of outside hinges for the two doors which are arranged to throw the doors farther away from the body when entering or leaving the car. The deck at the rear has been raised and enlarged, providing room for three or four suitcases. The new type of fenders curve down over

the rear wheels to a point on a line parallel with the hubs.

A two-piece style of windshield replaces the three-piece, and tips slightly, thus avoiding any possibility of glaring. A visor, covered with black, reinforced leather, with panel effect, slants out over the top part of the windshield in such a way that it shades the driver's eyes and to act as a rain shield.

The color scheme is dark blue for the body and interior upholstery, with the driver's seat and wheels in black. The price is \$2850 f. o. b. Detroit.

American Bosch Magneto Now Selling Agent for Gray & Davis

Officers of Springfield Corporation Have Control of Operation of Boston Concern

BOSTON, Aug. 9.—Stockholders of Gray & Davis, Inc., at a special meeting here, authorized an agreement whereby the American Bosch Magneto Corp. of Springfield becomes the exclusive selling agent for the starting, lighting, battery ignition systems and other accessories made by the Boston company. The agreement provides for immediate executive control by the Bosch company and the new officers of Gray & Davis are:

President, Arthur T. Murray, president of the Bosch Magneto; vice president, George A. MacDonald, treasurer of Bosch Magneto; vice president and general manager, G. J. Long, vice president of Bosch Magneto; treasurer, B. J. Moses, treasurer of Gray & Davis.

Ten Per Cent Commission

The contract will not cover products not related to motor vehicles, such as the unit car, house-lighting system, and induction motor. The commission payable to the American Bosch Magneto Corp. will be ten per cent of the net prices except as to articles sold at retail through service stations which will be sold to American Bosch Magneto Corporation at a fixed discount from list prices.

As a condition of entering into the selling agreement American Bosch Magneto Corp. will require that its officers be given control of the operation of this company, and in order to secure their interest in the management an option running until January 1, 1924, will be given by Gray & Davis, to the new managing interests on any part or all of 30,000 shares of its common stock at par in cash, \$25 per share.

Offer Many Inducements To Dispose of Used Cars

Kansas City, Mo., Aug. 7.—Passenger car distributors here are making unusual efforts to dispose of their stock of used cars. Due to limited credit facilities, improvement in new car deliveries and a stagnant used car market dealers are making extraordinary terms and low prices to attract buyers. Many dealers who have been taking used cars in exchange on new sales find themselves overloaded with used cars which, due to the stringency in credit and the poor buying market, are making a heavy burden upon them.

Farmers are the principal buyers of used cars but at this time they are engaged in farm work and are not coming here to buy.

Several large distributors have been holding used car sales which they are heavily advertising. The majority of used car buyers make time payments which at this time are unusually hard to finance. Financing companies demand high rates and large premier payments.

Ford Applies for Authority to Issue Stock for Railway

Will Assume Liabilities of Detroit, Toledo & Ironton Line and Rehabilitate Property

WASHINGTON, Aug. 9—Attorneys representing Henry Ford have filed an application with the Interstate Commerce Commission for authority to issue \$1,000,000 in capital stock for the Detroit & Ironton Railway, as lessee for the Detroit, Toledo & Ironton Railway. The application explains in detail the financial standing of the Detroit & Ironton Railway, which was incorporated under the laws of Delaware. It is the intention of the Ford interests to assume the liabilities of the D. T. & I.

The Commission has been advised that the Detroit & Ironton Railway Company will not issue any stock to the public. According to the applicants, the D. T. & I. Railway has been operated unsuccessfully since its incorporation in 1914. The Ford interests propose to rehabilitate the property to provide better service for the shipping and traveling public.

The incorporators of the Detroit & Ironton Company as given to the Commission are Joseph A. Gordon, president; Fred Osborne, vice-president; E. C. Davis, secretary-treasurer and Alfred Lucking, attorney.

Dunlop America Announces Plans for Tire Production

Buffalo, Aug. 7—First announcement of the plans and policies of Dunlop America, whose great tire plant is now under construction in the River road district here, has just been made by Perry D. Saylor, vice president and general manager of the firm.

Mr. Saylor announced that the entire plant, which will cover twenty-nine acres, will be devoted to the production of cord tires. Four units will be erected, solid, heavy truck, Ford sizes and ordinary size tires being produced in each. Some of these units are now nearing completion.

Expect to Employ 7000

It is planned to begin operations with about 7000 employees, and this force will probably quickly be increased to 10,000. There are now close to 3500 workmen engaged in building the plant.

The plant is being erected on a unit basis, each being 120 by 540 ft. Eighty-foot roadways, walled and covered, connect the units. In some cases two or more units are combined into one building. Three hundred acres are included in the firm's holdings, with an additional sixty-nine acres which will be used for the present as an athletic field.

SOLVING CAR THEFT PROBLEM

Buffalo, Aug. 7—Police Chief James Higgins believes he has a good start toward solving the automobile theft problem.

Appointment of an automobile squad has reduced stealing here nearly fifty per cent during a fourteen months period, while thefts have increased on an average of twenty-two per cent throughout the nation.

From May 1, 1918, until July 1, 1919, more than 1500 cars were stolen in Buffalo. Then an automobile squad was appointed, composed of detectives and patrolmen, to devote its entire time to the prevention of thefts and punishment of thieves.

From May 1, 1919, until July 1, 1920, fewer than 850 cars were stolen here, and it is expected that 1920 will show a record of fifty per cent of the number of thefts of 1919.

INCREASE IN PRICE OF ELGIN SIX

Chicago, Aug. 6—On July 29 the price of the Elgin Six was increased \$110 on each model. The new prices are as follows:

Touring	\$1775
Scout	\$1895
Sedan	\$2685

MANY ENTRIES FOR FRENCH RACE

Paris, July 24—Twenty-eight entries have been received for the French 85 cu. in. light car race to be held near Le Mans on Aug. 29. The competitors represent eighteen firms, of which eleven are French and two British, as follows: Sizaire-Naudin, Leon Laisne, La Licorne, Cognet de Seynes, Major, Tic-Tac, Bugatti, Baby-Peugeot, Majola, Bignan-Sport, Mathis, Silver Hawk, and G. N. This race, which is the only automobile speed contest to be held in France this year, has the smallest piston displacement ever adopted in Europe.

Creditors of Jones Motor Apply for Receivership

Kansas City, Aug. 7—Difficulties encountered in disposing of motor credit paper to banks for rediscount has brought the Jones Motor Co. of Wichita, Kansas, manufacturer of the Jones Six, under an application for receivership before Circuit Judge Kimbrough in the Federal court here. Creditors of the firm presented the petition. Attorneys and officials of the company declared that the firm was solvent and was willing to agree to the appointment of a receiver to operate the business during the present money shortage.

Creditors May Halt Proceedings

Creditors when shown a statement of the company's assets agreed that the bankruptcy proceedings would not be advisable. The case was taken under advisement and the court's decision will be announced later.

Though this is the first case of bankruptcy proceedings brought recently to the federal court, the money stringency in the wheat belt, where all available funds are being turned to harvest needs, is still very great. Bankers predict that the stringency will be maintained for some time as the corn and cotton crops will follow the wheat to market.

Urges Industries Co-operate for Conservation of Gasoline

Secretary of American Petroleum Institute Outlines Remedies for Present Shortage

NEW YORK, Aug. 7—Means by which the present shortage of fuel for internal combustion engines can be remedied are outlined in a memorandum addressed to 5000 members of the Society of Automotive Engineers by R. L. Welch, general secretary of the American Petroleum Institute. They are:

"First, the Government of the United States must co-operate with the oil business and with the automotive industry at home and abroad if the gasoline problem is to be solved.

Must Get More Gas from Crude

Second, the greatest possible efficiency must be gotten by the automotive industry and by the consumer from engine fuel or the problem will not be solved.

Third, the oil industry must be more efficient and must get more gasoline from each barrel of crude.

With reference to the second remedy, Mr. Welch says: "There is need to curb the present demand of the American public to have motor cars with engines developing 70 to 80 horsepower which are operated generally at twenty miles an hour."

As a preface to his memorandum Welch says: "The time has arrived when it is possible to say, as far as ordinary human foresight can go, that the engine fuel of the future probably will be substantially the same product known as gasoline to-day." He adds however that "It seems equally clear that there will not be enough to go around unless the automotive industries co-operate to conserve gasoline."

Cut Down Horsepower

"The time has now come when it would seem as though the problem of the automotive industry is to build engines that instead of making from seven to twelve miles on a gallon of gasoline will make twenty or thirty on the same amount. The problem now is to build engines to burn refined oil, or some product of petroleum other than the present fuels. At the present time there is not enough petroleum to meet all requirements.

"Should not the horsepower of the heavy cars be cut down and could not the cheaper and lighter cars be so equipped so as to get all the speed desirable from a very much smaller amount of gasoline than is now used?"

Mr. Welch points out that the production of crude oil in 1911 was 314 barrels for automotive vehicles but that it had fallen to fifty barrels per vehicle in 1919. This production of crude will be cut down this year to forty barrels per car, and if 12,000,000 automotive vehicles are registered in 1922, he predicts that there will be produced in this country only thirty-five barrels of crude oil per car.

University on Wheels to Give Lessons in Truck Operation

Will Also Teach Repair Work as Result of Highway Educational Committee Conference

WASHINGTON, Aug. 7.—The permanent Committee on Highway and Highway Transport Education determined at its first meeting held at Pittsburgh Saturday that an intensive and exhaustive investigation into all phases of highway economics should be undertaken immediately to provide the necessary data for the establishment of acceptable principles which, in turn, could be effectively translated into material for a textbook. The purpose of the text-book is to develop the thought-power in all communities on these subjects through the diffusion of authoritative information. This educational program which is purely co-operative will be conducted by a permanent organization selected from the nation's leading educators and scientists within a few months.

Study Economics of Trucking

Just what the committee proposes to do was illustrated by Roy D. Chapin, of the National Automobile Chamber of Commerce. Inasmuch as this movement marks the first time in the history of highway transportation that there has been a unification of all interests, Mr. Chapin believes it is possible to develop economics of highway travel to the same value as the principles which govern railroad transportation. As this field of economic endeavor has been only lightly explored, Mr. Chapin contends that the work of the committee should afford a basis for a working text-book.

The committee on vocational training and extension education is charged with devising adequate methods for extension of education regarding highway transport and automotive subjects in vocational schools and to bring about a closer co-operation between state highway departments and various university extension departments. One of the principal missions of this organization will be to substitute wherever possible, the gas combustion engine as a unit for analysis instead of the steam turbine. They will also endeavor to encourage students in specialized knowledge especially in automotive research and design. The industry has expressed a willingness to permit instruction during the summer in factories, with pay.

University on Wheels

One of the outstanding features of the conferences was the decision of the University of Pittsburgh to lead the way in the educational movement. They will send out a "University on Wheels" this fall and winter. A completely equipped truck will visit garages in every community for the purpose of a practical demonstration. A lecturer will explain the object of the visit and give lessons in truck-operation and repair. Various

other types of automotive equipment, including passenger cars and tractors, will be demonstrated. Factories will provide motion pictures and other illustrations which will aid in these special courses. Highway engineers will co-operate and explain the fundamentals of highway construction. In this way, it is believed the interest of the farmer and every other prospective truck or passenger car owner will be stimulated.

TO OPERATE HYDROPLANES DAILY

Cincinnati, Aug. 9.—Development of hydroplanes is looked upon with interest by the automotive industry for the time will come when servicing them will fall to its lot and they will be taken care of in just the same way and by the same people who are taking care of automobiles now.

Daily hydroplane service between Cincinnati and Louisville will be inaugurated within the next week, according to

Bloomington, Ill., Aug. 9.—In moving corn from the farm of J. B. McReynolds in McLean County, motor trucks made the round trip from the farm to the elevator and back, three and one-half miles, in twelve minutes. The expedition with which the grain was moved as compared with the slow moving teams was a revelation to the farmers. It was estimated that four men with automobile trucks equaled the movement of twelve men and twelve teams.

notification received by Mayor Galvin from the Ohio Valley Aero-Transport Co. of Louisville. Passengers, mail and express will be carried.

National Tractor Show Plans Going Forward

Columbus, O., Aug. 9.—Preliminary arrangements for the National Tractor Show, which will be held in Columbus February 5 to 12 inclusive, were made at a conference between the National Tractor and Demonstration Show Committee, representing the national association, with the local committee. Findlay P. Mount, chairman of this committee, together with a special committee consisting of E. J. Gittins, Jesse Everson and President Brantingham of the Emerson-Brantingham Implement Co. comprised the visitors.

It is announced that more than 150,000 sq. ft. of space in the various buildings on the Ohio State Fair Grounds will be used for the show. Diagrams of the space and all of the conditions for exhibiting are now being printed and will be mailed out within a week or ten days. After that date a special space committee and Manager E. E. Whaley of the show will start booking space.

Large Revenue for City from Automobile Industry

New Occupational Tax Schedule Affecting All Lines of Business Prepared for Cincinnati

CINCINNATI, Aug. 9.—The automobile industry in Cincinnati will turn large revenues into the city's treasury under the provisions of a new occupational tax schedule just compiled by a committee appointed by Mayor Galvin. The schedule is expected to raise \$650,000 annually for the city's coffers and affects virtually all lines of business in the city.

The sections applying to the industry are as follows: automobile dealer, accessory dealer and automobile repair shops, no employees, \$10; one or more employees, \$5 each; garages, one to twenty machines, \$15; \$1 for each additional machine; schools, \$25; gasoline stations, \$100 for each station; gasoline pumps and tanks, \$10 for each pump; second hand automobile dealers, \$50.

Automobile manufacturers will come under the head of manufacturers, which includes all lines of business. Manufacturers with no employees pay a tax of \$8. A \$2 tax is imposed on each employee so that a company with 500 employees would pay a tax of \$1008.

Deluged With Requests for Space at Indiana State Fair

Indianapolis, Aug. 9.—Although the big fall show of the Indianapolis Automobile Trade Association to be held in connection with the Indiana State Fair Sept. 6-11, is still a month away, John Orman, manager of the show has been deluged with applications for space far in excess of the amount available.

Mr. Orman says that 59,000 sq. ft. of floor space is the very maximum that can be arranged for in the Manufacturers building and he now has application for 68,500 ft.

Two courses are open, either the pro-rata allotment of space to the exhibitors must be cut down or else an overflow show must be arranged for in tents adjoining the main building. The Manufacturers building was completed just a year ago. It was built for the express purpose of housing the automobile exhibits and at the time it was thought it would provide ample space for the next fifteen years at least. In one year it has become inadequate to meet the demands put upon it.

ROMORT INCREASES CAPITAL

Fond du Lac, Wis., Aug. 9.—The Romort Mfg. Co. of Oakfield, near Fond du Lac, has increased its capitalization from \$100,000 to \$150,000. It is a large manufacturer of a combination air and water service appliance for garages, as well as of air valves used in inflating tires. The business was established in 1916 and has increased 100 per cent each year since that time. The president is A. A. Ewald.

Greater Use of Barge Canal For Automobile Shipments

Individual Firms and Cities Reported to Be Negotiating for Transportation Facilities

ROCHESTER, Aug. 7—Leaders of industries in the West, dispairing of railroad freight conditions are reported to be planning to combine for the construction of barges and other facilities to ply the New York State Barge Canal.

That the automobile industry will soon utilize the canal on a big scale is evidence by reports from Detroit and Buffalo. Last week a Detroit automobile manufacturer sent a big shipment by canal because it was quicker than the railroad. Whatever relief the railroads are going to give the automobile industry will probably not be forthcoming in the next two or three years, say automobile and railroad men in the Middle West.

Reports have been current here that Ford interests have been attempting to secure shipbuilders along the canal to construct barges especially designed for the carrying of automobiles, and the Overland company, of Toledo, also is said to have been negotiating with firms.

At present there are not more than 3,000 barges on the canal, and many of these are relics of the old Erie canal.

These have been requisitioned for months ahead. The canal itself, including all maintenance and also towing service for boats under their own power, is under the direction of the state. Edward S. Walsh recently put a steamer and four consorts through the canal from Buffalo to New York in 104 hours, loaded. The average carrying time, however, is ten days to two weeks between Buffalo and New York, as well as points adjacent to the latter.

Plan to Operate on Lakes

The situation has given rise to the rumor that Detroit and Cleveland organizations are planning to build and operate barges on lakes as well as the canals, with the idea of no transfer from the lake point of loading until the barge reaches New York, Providence or other seaboard points. Regarding the feasibility of such a course there is a divergence of opinion, some claiming that a boat built to stand the buffeting of the lakes would be too unwieldy for the canal. It is said, however, that the experiment will be made.

TO MAKE AUTOMOBILE RIMS

Columbus, Aug. 11—The Standard E. Z. Rim Co., recently chartered with a capital of \$25,000 has purchased a machine shop here which will be fitted up for the manufacture of the patented automobile rims. The rim is collapsible with many new features.

Bondholders Are Reorganizing to Buy in Cincinnati Speedway

Interest Revived in Its Purchase with Announcement of Reappraisal of Property

CINCINNATI, Aug. 9—The Cincinnati Speedway at Sharonville, near Cincinnati, has turned out to be a real white elephant. No one seems to want it although it has been put on the auction block several times in an effort to raise enough money to satisfy the bondholders.

Coincident with the calling off of the most recent attempted sale, it was announced that the bondholders are reorganizing to buy it in but that the reorganizing had not been completed. The bondholders previously had refused to consider its first appraisal of \$200,000, which would have enabled them to get it for \$133,333, two-thirds of the appraised value.

The property has been reappraised at \$120,000 which will enable the bondholders to purchase it for \$80,000. It is considered likely that they may take it over and attempt to operate it and regain their investment of \$200,000. There is, apparently, no opportunity for the stockholders, holding \$500,000 worth of stock, to get anything out of the property.

How the Lexington Motor Co. Promoted Good Fellowship Among Its Distributors



Here is an example to follow in promoting good fellowship in the industry. The pictures show views of Camp Lexington near Connersville, Ind. where distributors of the Lexington Motor Co. camped for four days incident to the annual convention of the company. All tents were floored and electric light and power lines were run two and three miles to the tented city. Hot and cold showers and a barber shop were among the comforts provided



Obtains Restraining Order Against Holmes Company

Air Cooled Engine Forms Basis of Action Brought by Cameron Motors—Other Pending

BRIDGEPORT, CONN., Aug. 7—A temporary injunction restraining the Holmes Manufacturing Co. from manufacturing or selling any air cooled engine embodying the essential features of the product of the Cameron Motors Corp. has been granted the Cameron Motors Corp., by Judge Frank D. Haines, in the Superior Court in Fairfield County, Conn.

In granting the injunction Judge Haines points out that no attempt is made to determine the merits of the case now pending, which involves the right of the Holmes Manufacturing Co. to break a contract for 5,000 engines given by the Cameron Motors Corp., and put their own engine on the market in competition with them. He also calls attention to the fact that the Holmes Manufacturing Co. admits that it was the purpose when designing the new engine to model it so closely after the Cameron product that the tools and materials which had been provided for the manufacture of the plaintiff's engine could be used largely in the manufacture of the new one.

Denied Right to Competition

In his memorandum Judge Haines says: "It is not proposed in this proceeding to determine the defendant's right in general to design a motor of their own, but the plainest rules of equity and fair dealing require that no advantage be taken of the information furnished the defendants by the plaintiffs for the building of the plaintiff's motors. So long at least as this relation between the parties exists, the defendants should be denied the right to enter into destructive competition with the plaintiff's product, or substitute their own motor for the motor they agreed to manufacture for the plaintiffs."

NO PRICE CUT FOR JOBBERS

Baltimore, Aug. 7—The Black & Decker Mfg. Co., makers of portable electric drills, electric valve grinders and electric air compressors, has informed its jobbers that there will be no price reductions this year on their products and that starting January 1 next, jobbers will be protected against price recessions for sixty days after they buy. The company explains that no lowering of costs is possible at present, but that if it does become possible in the future it will be made promptly and the company will absorb any loss resulting from its guarantee.

PLAN MOTORIZED-THE-FARM TOUR

Memphis, Tenn., Aug. 9.—The Farm Development Bureau of the Chamber of Commerce met here recently in conjunction with representatives of various automobile truck dealers of the city of

Memphis to consider the putting on of a motorize-the-farm tour through eastern Arkansas. C. W. Watson of the Farm Bureau announces that the probable itinerary will include Osceola, Blytheville, Jonesboro, Harrisburg and Wynne, including in their journey several intermediate points. Sept. 13 to 18 are dates considered.

FORM ELECTRIC SERVICE ASSN.

New York, Aug. 7—The Automotive Electric Service association, a national organization, has been organized with D. W. Burke of the Auto Electric & Service Corp. of Detroit as president. It will be affiliated with the Automotive Electric association which is made up of manufacturers. One of its objects is to improve the co-operation between the members and the manufacturers they represent.

Other objects of the new organization are to encourage the use of only genuine parts for repair or replacement service, to raise the standards of service, to collect and disseminate statistics of service to members and to discuss subjects of general interest.

The officers in addition to Burke are: Vice president, R. R. Thomas, Electric Equipment Co., Los Angeles; secretary, P. J. Durham, P. J. Durham & Co., New York; treasurer, Frank Duffick, Electric Power & Maintenance Co., Toledo.

Membership is open to any service station representing one or more manufacturers of electric automotive equipment.

Overland Finishes Economy Run Across the Continent

Toledo, O., Aug. 7—An unusual economy run has just been finished by a stock Overland car, which was driven across the continent, a total of 3,442 miles from New York to San Francisco, with an average of 27.2 miles to the gallon. The unique feature of the run is that the car was handled by twenty-five different drivers. It was relayed across the continent by Overland distributors starting at midnight July 18 and arriving 179 hours later, or approximately 7½ days. Eleven states were crossed during the run and all sorts of roads encountered. The car was driven night and day, being stopped only for the refilling of the gasoline tank and change of drivers.

Different Averages in Various Sections

One of the interesting features of the run was the variation in performance along different parts of the route. From Pittsburgh, Pa., to Lima, Ohio, the car averaged 28.7 miles per gal. To Cedar Rapids, Iowa, over sand, gravel and ordinary dirt roads, the average was 30.4. From North Platte, Neb., to Cheyenne, Wyo., a stretch of very bad, rough roads, the average was 33.2. The poorest economy was found in the state of Nevada, because of the terrific grade encountered. During this part of the trip, the average was 26 miles per gal. From Reno, Nev., to San Francisco, against a strong head wind, the average of 32.2 miles was maintained.

Golden Rule Methods and Good Service Recommended

Transaction of Sale of Truck Should Not End With Delivery Says Representative

NEW ORLEANS, Aug. 7—Do you as a salesman sell your truck and then forget about it?

And do you fail to figure out just what kind of truck would best suit the needs of the purchaser?

W. A. Nielson, representative of the Transport Truck Co., after spending two weeks among the truck dealers of the Crescent City studying the southern truck situation and its prospects, says that good service and strict adherence to the Golden Rule are without doubt the greatest assets in the selling of trucks.

Must Be Transportation Expert

"The successful truck salesman," he states, "must be a capable transportation expert as well as possessed of full knowledge of just what the truck he represents will and will not do. If the transaction of the sale of a truck ends when the check is received and the truck delivered the investment is 50 per cent failure. The Golden Rule dealer's responsibility has just begun with the delivery of the truck and the quicker all dealers and salesmen realize this the more rapidly will their sales increase and the more generally will they be greeted with a warm welcome and larger orders, even repeat orders, in sections where they have once sold a truck to a customer who has been thoroughly satisfied with the selection they have made for him and his needs."

SHIPPING SITUATION IMPROVES

New York, Aug. 7—The National Automobile Chamber of Commerce has received reports from the Cleveland Toledo district which indicate considerable improvement in the car supply for the shipment of automobiles. It is regarded as purely temporary, however, and rather as the lull before the shortage which will come when the crop movement begins to reach its peak in a short time. The increased supply of cars is construed as meaning that there has been a very sharp curtailment of production in all lines of manufacture. Automobile shippers also are being aided by the ruling of the Car Service Commission that open top cars may be used for shipments into the mining districts to which the cars are being sent to bring out coal.

VULCAN TRUCK FOR CANADA

Montreal, Aug. 7—Walter E. Walker, director and general manager of the Vulcan Motor & Engineering Co., Ltd., Southport, England, a branch of the Harper Bean combine, has arrived here with the object of bringing the Vulcan motor truck to the notice of Canadian manufacturers, dealers and bankers. His ultimate plan is the establishment of a branch factory in Canada for the manufacture of the trucks.

Front Wheel Brakes To Be Tested At Elgin Road Race

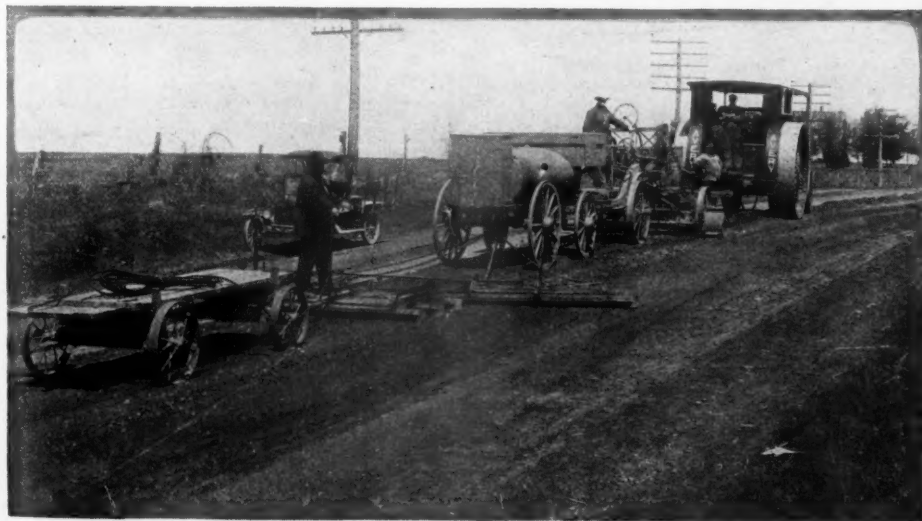
Device Generally Accepted in European Circles Will Get First Try-out in America

Standing of leading drivers in A. A. A. championship.

Rank	Driver	Points
1.	Gaston Chevrolet	1015
2.	Tommy Milton	670
3.	Jimmy Murphy	665
4.	Rene Thomas	520
5.	Joe Thomas	296
6.	Ralph Mulford	270
7.	Eddie Hearne	205
8.	Ira Vail	140
9.	Ralph De Palma	105
10.	Ira Goodson	61

CHICAGO, Aug. 7—Front wheel brakes will get their first real tryout in the Elgin road race which is to be held Aug. 21 under the auspices of the Chicago Motor Club. This is the first road race of consequence in several seasons, since the front-wheel brake came into general acceptance in European circles, and is therefore the first American test of the device.

Ralph De Palma really started the ball



Planing the surface of the eight-mile Elgin course for the 250-mile road race August 21. Thirty thousand gallons of oil will be spread over the surface and every wrinkle smoothed out. The course this year is very fast, and most of the drivers are equipping their mounts with front wheel brakes which will enable them to approach the turns at a greater speed

rolling when he told officials of the Elgin race that he proposed to equip his Ballot racer with brakes of this kind. No sooner had Fred Duesenberg and Louis Chevrolet heard of this than they set to work fitting their cars and now nearly every entrant in the race is working on similar apparatus.

It is believed the application of the front wheel style of brake will speed up the race to a considerable extent. It will enable the drivers to go into the turns

at a greater speed than has been the case in former years which will lessen the loss of speed occasioned when they were forced to shut off power several hundred feet before reaching the curves. The quicker action of the front wheel brakes is also expected to minimize the danger of accident on the tricky Elgin course.

Six of the first ten drivers in the contest for the American automobile championship have already entered. Included in this number are the holders of first, second, third, sixth, seventh and ninth positions and the six are the men who are generally considered the real contenders for titular honors. Of the four who are now missing from the Elgin entry, Rene Thomas, who holds fourth place, is back in France and will compete in no more American races, while Joe Thomas, fifth, Ira Vail, eighth, and Ira Goodson, tenth, have been unable to secure cars which will qualify within the Elgin limit of 183 cu. in. piston displacement.

The men entered in the Elgin race, however, are the half-dozen men who are generally considered the men who are in the fight for honors.

Entry List Promises Speed

They are Gaston Chevrolet, Tommy Milton and Jimmy Murphy, holders of first, second and third place; Ralph Mulford and Eddie Hearne, sixth and seventh, and Ralph De Palma, ninth. Their standing is based on points made in the speed-

A. A. A. To Take Up Foreign Racing Matters With France

America Occupies Outlaw Position in Europe Due to Non-Existence of Reciprocity

PARIS, July 10—As an automobile power, the position of the United States in Europe is not better than that of Germany. There exists in Europe an International Association of Recognized Automobile Clubs comprising every European nation, except Germany, which nation was eliminated on the outbreak of war and has not been reinstated.

A disadvantage of this outlaw position is that American speed records are not recognized in Europe. A few weeks ago the International Association of Automobile Clubs met in France and officially accepted the world's mile flying record at 124.10 miles an hour, put up by a German car in England. Ralph De Palma's work for Packard is considered as non-existent, and Tommy Milton's high speed on the Duesenberg has no official recognition in Europe. The records at Indianapolis, although the timing there is infinitely superior to anything known in Europe, have no standing.

Hinders Advertising Records

The danger of this situation is that the holder of American records can claim no credit for his performances in Europe. If he attempted to advertise these records, the holder of the lower but officially recognized speed performances would have the right to insist on his advertising being withdrawn.

This situation arises from the fact that the American Automobile Association, which has control of racing in the United States, has no standing in Europe and does not appear ever to have attempted to assert its importance away from home. So far as Europe is concerned, the only body in America entitled to speak in the name of the American automobile movement is the Automobile Club of America. This club has no American speed records to put forward, for it has no connection with American racing.

Washington, D. C., Aug. 7—"Racing relations between the United States and

(Concluded on page 54)

Expanded Line of Dual-Valve Trucks by Pierce-Arrow Co.

Buffalo, Aug. 7—Announcement of an expanded line of motor trucks, powered by dual valve engines, is made by the Pierce-Arrow Motor Co. The new line includes 5-ton, 3½-ton and 2-ton trucks and a tractor unit, each equipped with double ignition and electric lights.

"The dual-valve engines equip the trucks with a pulling power superior to any demand," Robert O. Patten, truck sales manager of the company says. "Moreover, this power is obtained with an increase in economy; gasoline yields more miles a gallon."

way races at Los Angeles, Indianapolis and Tacoma, respectively, the only contests which have so far been designated championship events.

Several things have occurred since Memorial Day which have militated to keep the Elgin entry list smaller than the one at Indianapolis. The failure of the French cars, the Peugeots, Ballots and Gregoires to come up to expectations at Indianapolis caused their builders to

(Concluded on page 54)

Closer Gasoline Rationing Due to Navy Yard Demands

Delay in Bringing Oil From California Contributes to Restrictions Placed on Consumers

SEATTLE, Aug. 7—Large deliveries of gasoline made to the Puget Sound Navy Yard at Bremerton on demands made through the offices of the United States district attorney at Seattle has necessitated closer rationing of private cars in the Puget Sound district. As a result of the deliveries to the Navy Department and delays in bringing new shipments of oil from California, automobiles were recently placed on a ration of three gallons of gas by the Standard company in place of five, and trucks were reduced in their allowance from ten to seven gallons.

Allow One-half Capacity

The Shell Co. of California is maintaining the same allowance of gasoline which it has had in effect for several weeks. This is 50 per cent of the tank capacity for passenger cars and up to ten gallons for trucks. The Union Oil Co., which sells exclusively to distributors and does not maintain its own service stations, report supplying its connections with "sufficient gasoline for strictly legitimate needs." Supply of the Union Company was increased 20 per cent in July over the supply the month previous. The August supply increase is expected to be 10 per cent greater than that of July.

The automobile, tire and motor accessory dealers in Seattle and other Sound cities and towns fail any more to be swayed, either favorably or unfavorably, as reports of decreasing or increasing supplies of gasoline are issued. The best portion of the motoring season has gone and they have passed through a most trying period, which has caused a considerable thinning in the ranks along automobile row.

NO SALE OF MONROE PLANT

Indianapolis, Ind., Aug. 6—Offers recently made to the William Small Co. for the purchase of the Monroe plant were not large enough to consummate the deal. According to Walter G. Todd, secretary and treasurer of the William Small Co., the sale of the factory was contemplated, but owing to the smallness of the offers, all idea of selling has for the time being been rescinded. Mr. Todd stated that the factory at this time is not for sale unless it is to some legitimate purchaser who would be willing to invest a sufficient amount of money to justify the deal. It has been widely reported that an offer was made by a prominent Detroit parts manufacturer.

NEW CHEVROLET ZONE CREATED

Portland, Ore., Aug. 7—A new Chevrolet distributing zone for the Pacific northwest, to be known as Zone 20, has been created with Portland as its head-

quarters, according to announcement just made by C. M. Steeves, assistant sales manager of the Chevrolet Motor Co. of California. Up to the present, the Northwest has been included in the California zone. The new zone includes Oregon, Washington, Idaho and western Montana. M. D. Douglas will be manager of the zone and C. L. Dunham, manager of the Chevrolet branch here, will be his assistant. The Chevrolet company, Mr. Steeves announced, also will erect a building in Portland with at least 60,000 ft. of floor space as Northwest office and distributing headquarters.

BIG FORDSON DEMONSTRATION

Des Moines, Iowa, Aug. 6—What is probably the biggest individual distributor tractor demonstration ever attempted in the middle west will be put on at Ames, Iowa, Aug. 11, 12 and 13, by the Herring Motor Co., Fordson distributors. The demonstration of power farming will be given with the co-operation of the state agricultural college which is located at Ames, and will be held on the college farms.

Fifty Fordsons will be in the fields every day and the chief aim will be to show the farmer just what the tractor will do in plowing, discing, pulverizing, seeding, baling hay, grinding feed, shelling corn, etc.

Free Life Insurance Given Employees by Liberty Motor

Detroit, Aug. 9—The Liberty Motor Car Co. is furnishing its employees with life insurance policies free of charge. After an employee has served 6 months, he is given a life insurance certificate for \$500 and for every 12 months thereafter another \$100 is added. During the month of July, 48 new policies were issued to employees. To the beneficiary of one employee during July, \$900 was given, inasmuch as the employee had been with the company for more than four years. Arrangements are made whereby an employee, if he should leave the company, can take the policy with him and keep up the payments. No physical examination is required in the issuance of these policies.

NEW CASE TRUCK FOR FARM

Racine, Wis., Aug. 7—The J. I. Case Plow Works Co. of Racine, Wis., is engaging in the manufacture of a motor truck designed especially for farm purposes, as an addition to its present line, including the Wallis tractor, Wallis thresher and Case Implements. The new truck, which will bear the name of Case, has been in development for more than a year. In addition to new gray iron, malleable iron and steel foundries, and additional machine shops now under construction for the Case company at Racine, at an estimated cost of \$750,000 or more, ground has been broken for a four-story building, 123x138 ft., at Mead and Water streets, to cost \$140,000 and be used largely for the motor truck department.

Urges Pacific Coast to Act on Fuel Discrimination

F. E. Moskovics Says Demand for Equal Country-Wide Rationing of Gas Should Be Made

PORTLAND, ORE., Aug. 6—Discrimination by oil companies against the Pacific coast territory in gasoline distribution is not only unfair but cannot be satisfactorily explained, declared F. E. Moskovics, vice-president of the Nordyke & Marmon Co., in an address at a luncheon of the City club at the Benson hotel here.

"What affects one part of the country ultimately affects the whole country," he said. "People of the Pacific coast should demand an equal rationing of gasoline throughout the country. Instead of the shortage being felt acutely in one part of the country, let it be felt slightly in all parts. If the oil companies are not able to bring about an equalization of the supply, let the government take a hand."

Shortage Felt Only on Coast

Shortage of gasoline is not felt anywhere in the country except on the Pacific coast, he added. Mr. Moskovics explained that he has been investigating the gasoline situation in the East and finds no complaint in any quarters as to lack of fuel. The fact that automobiles have increased greatly in numbers on the coast, urged by the companies as the reason for the shortage, he said is not a legitimate reason, and cited the fact that Iowa has increased its automobile registration more than any other state, yet has all the gasoline it needs.

"The oil companies might have foreseen this situation months ago and made provision against it," he said. "If the dealers here can go out in the open market and purchase fuel from independent sources, then the distributing companies can do so. And if the distributing companies are now buying gasoline in the Texas fields to relieve the coast shortage, as they report, they could have done so weeks ago."

SEPARATE SERVICE UNIT FORMED

East Moline, Ill., Aug. 7.—The Root & Van Dervoort Engineering Co. has separated the operation of its departments so that hereafter the engineering plants which are engaged in the manufacture of commercial motors will comprise the major unit and the automobile service department occupied by the R. & V. Knight automobile activities will form the other.

PRETENTIOUS STATION IN LUDLOW

Ludlow, Ill., Aug. 7—Orlo Sheehan and J. W. Johnson, Ludlow, Illinois, have opened a new garage costing \$10,000. Of such structures among the smaller towns of the county, this ranks with the best. The firm will do a general repair and storage business and also operate a sales agency, handling several makes of motor vehicles and accessories.

Goodrich Tires To Remain At Their Present Prices

**Agree to Stand Back of Prices on
All Goods Sold Prior
to November 1**

AKRON, Aug. 9—The tire trade has been advised by the B. F. Goodrich Co. that prices of all sizes and classes of Goodrich tires are guaranteed until Nov. 1. The fixing of Nov. 1 is said to have no significance except that it marks the end of the dealers' contract selling season. A letter sent out by the company says:

"Public sentiment is considerably affected by rumors of approaching declines in commodity prices, so much so in fact that we feel it advisable to make a plain statement of facts regarding this situation so far as Goodrich tires are concerned.

"Due to present high costs of fabric, labor and other elements entering into tire production costs, with no evidence of any lowering of these costs, there can be no possible justification for the reports current in some quarters of a decline in tire prices.

"In the event of any unforeseen condition arising which would enable us to make a general reduction in our present schedules prior to Nov. 1, we will stand back of our guarantee by protecting Goodrich dealers on all stocks on hand unsold at the time of such reduction, which were purchased between the present date and Nov. 1."

FORDSON TEST FOR MISSOURI

Kansas City, Aug. 6—A successful tractor test and demonstration from the point of view of performance has been held at Columbia by the Ford branches of Kansas City and St. Louis which was attended by more than 400 Fordson

dealers and service men in Missouri.

In the morning instructions were given in the pavilion of the Missouri State College of Agriculture on the tractor and tools used. For the demonstration in the afternoon at McVaine, eight miles from here, thirty tractors were put in action.

DESIGNING NEW PASSENGER CAR

Manitowoc, Wis., Aug. 9—The Jacquet Motor Corp. of Manitowoc, Wis., has been incorporated with a capital stock of \$100,000 to manufacture passenger and commercial cars, tractors, etc. The prime mover in the enterprise is Alfred J. Jackson, who is manufacturing trucks at Belding, Mich., and has now accepted the offer of the Manitowoc Association of Commerce to move the business and plant to that city. Frank M. Kadow and H. B. Kamschulte of Manitowoc are incorporators representing local capital. Besides building worm-drive trucks, Mr. Jackson is designing a passenger car which he intends to put in production as soon as practicable.

CONNECT STATE ROAD PROJECTS

Orange, Texas, Aug. 7—Work started August 4 on the ten miles of concrete-surfaced, stone-based highway which the town and country are building westward from Orange, through Bancroft station, to connect with other state road projects.

WAUKESHA MOTOR SHOWS GROWTH

Waukesha, Wis., Aug. 9—The Waukesha Motor Co., Waukesha, one of the largest manufacturers of heavy-duty engines for trucks, tractors, etc., in the Middle West, has increased its authorized capitalization from \$1,000,000 to \$2,000,000. The new issue will be absorbed principally by the original stockholders and the proceeds will be used for financing further extensions of production and the general growth of the business. Harry L. Horning is president and chief engineer.

Prepare for Manufacturing Gregory Fore Wheel Drive Car

**Kansas City Selected as Site for Proposed Plant. On Market
By January**

KANSAS CITY, Aug. 6—Ben F. Gregory, mechanic and inventor of the Gregory fore wheel drive car, has selected Kansas City as the site for the proposed plant for its manufacture. The model used for demonstrating here is a fore wheel drive with brakes on all wheels. This test machine is a reconstructed Scripps-Booth weighing 2000 lbs. The car will probably be placed on the market by the first of the year.

The Gregory-Craun Motor Car Co. is incorporated under the laws of Missouri with \$40,000 capital stock though it is the purpose of the company to increase its capitalization to \$1,500,000.

PLANE LANDING FOR FORT WAYNE

Fort Wayne, Ind., Aug. 9—During the special session of the Indiana legislature which has just come to a conclusion, a bill was passed under which Fort Wayne can secure a landing field for aeroplanes. The passage of this bill met with a lot of local enthusiasm as a number of events have recently centered the interest of Fort Wayne upon aviation and made this city realize that its favorable geographical location should make it an important stopping point on the air routes from the west to the east.

Chevrolet's Suggestion For Track Improvement Acted On

Uniontown, Pa., Aug. 7—A system of speedway track reinforcing suggested by Louis Chevrolet, veteran automobile racing driver and designer, is being installed at the mile and an eighth track at the Uniontown speedway in preparation for the Autumn Classic event on Labor Day.

For the first time since the track was built, Louis Chevrolet did not drive at the June 19 race, but with a number of cars entered witnessed the race as a spectator, principally from the starter's stand. A series of extended conferences between him and A. E. Corns, manager of the Speedway, were held with the result that suggestions by Chevrolet are being built into the track on which approximately \$40,000 is being expended preparatory to the Autumn classic.

ANDREW MOTORS CHANGES NAME

Milwaukee, Wis., Aug. 9—The Andrew Motor Mfg. Co., which recently was taken over by the members of the Wehr Steel Co., a large electric steel foundry concern in Milwaukee, has undergone a change of style to Andrew Mfg. Co. It originally was established to manufacture rowboat engines and small gas engines, but for some time has been conducted as a jobbing machine shop on automotive parts. This work will be continued and the shop will also handle machine work for the Wehr company.



One of the most novel floats that has been seen in a parade was that of the Pere-Marquette Railroad in the Traverse City celebration recently. The railroad company constructed a freight car of the box car type just one-half the size of a regular freight car and in exact proportions of the regular 36-footer and placed it upon a 1½-ton truck

Giving Service to Sell Accessories

(Concluded from page 15)

"caught short" in an emergency, because it was far from the automobile district. As previously stated, the business of the shop did not show any material return for the Carews for months after it was opened. And then the gasoline shortage came on.

The average man or woman would probably have considered that Fate had merely dealt another blow that must be warded off in the end with a big financial loss, or to fail. But not the Carews. They smiled and swung into action.

"I came to the conclusion that the gasoline shortage was the best thing that could happen for the dealer who was off the beaten path of the trade," said Carew. "It gave shops like ours an opportunity to develop friendly business relations that I am sure will last long after the shortage has gone its route and there is plenty of fuel oil again available."

The Carews put their philosophy into practice as follows: They purchased several score of tin cans that could be used as containers for gasoline. These cans were kept in a corner in the service department. The Carews then gained a select list of the motorists who lived in the surrounding vicinity or that passed the shop to and from the business district. Eager to get gasoline, motorists would drive up either in front or alongside the shop to inquire if any gasoline was available, just as they would stop at many other shops. It was a case in Seattle and other cities in the Pacific Northwest to keep on searching for the service tanks that weren't dry. The Carews would not bluntly reply that their supply was gone, as many did, but they would negotiate in most instances to make arrangements for supplying many of the inquirers in the future.

Distribute Fuel Carefully

The Carews were allowed seventy-five gallons of gasoline a day by the Shell Co. They did not distribute their allotment haphazardly on a "first come, first served" basis, but they distributed it judiciously.

Many were the offers they received of 50 to 75 cents a gallon from persons who were obviously from out-of-town, or from people whom the Carews believed rarely invade their district. These offers were firmly refused. There was to be no stigma of profiteering fastened on their shop.

All motorists whom the shop wished to cultivate as permanent customers were given the opportunity of purchasing one of the cans the Carews had bought at exactly the same amount that was originally paid for them. No profit was made on the cans. The motorist who had acquired a can could leave his order for five gallons of gasoline three times a week and when the shop received its allotment the can which bore the name of the owner would be filled and held in

the service department. Before many days had passed the Carews had developed several score "can owners." These motorists knew that they would receive gasoline on the days which the Carews had set for them to call. The whole matter of distribution of the allotment had been systematically worked out and every ounce of the precious liquid fuel was judiciously employed. There were no broken promises—no disappointments.

It has been many weeks since the Carews inaugurated their campaign of making permanent customers by giving "productive" service at a time when service spelt big things. And it is no playing upon the elasticity of words to declare that the Carews, by taking an optimistic view of the gasoline shortage and acting accordingly, have succeeded in putting their business on a very profitable basis. They went out to make permanent customers on "service" and they have succeeded.

Few of those who partook of the facilities offered by the Carews, it is reasonable to believe, will very soon forget the treatment they received from this shop when the obtaining of gasoline was a difficult and tedious matter.

Business from Cash Receipt

There is another feature to the merchandising policy of the Carews that developed during the gasoline shortage which has proven very profitable, and which operators of other accessory shops may well apply. This feature involves the cash receipt on sales, which many consider a waste of paper and effort.

Most motorists who draw up alongside a shop for gasoline or oil pay for their purchases without entering the shop proper, and in most instances no attempt is made by the dealer to bring them into the establishment. The Carews use the cash receipt as a link between the "outside" and the "inside." When a sale is made of gasoline or oil the motorist is asked in a casual way to "please drop inside" after payment is made. The dealer leads the way and the motorist instinctively follows, accepting the suggestion as a general rule in the belief that it is necessary to go inside to make change.

While the motorist is waiting for the receipt to be written, he has an opportunity to look around the store, and to appreciate the complete stock that is carried and the many little features of service that are visible. Possibly something may catch his eye that brings to memory an article that he had intended to buy for some days but had forgotten. In any event, the fact that the motorist has come into the store, whether he makes any additional purchase or not, serves to give him more than a passing acquaintance with the establishment.

The Carews of Seattle, Wash., are a

hard-hitting pair of accessory merchandisers and their method of making optimism pay may well be absorbed by others.

CLEANING CARS BY AIR AND WATER

(Concluded from page 11)

space which would otherwise be occupied by cars that are waiting to be cleaned.

Another point made by Mr. Tate is this: In the cleaning of cars by the old method and the drying of the parts with chamois, parts frequently remain moist and short circuits frequently follow. By the air-drying process, there isn't a chance for any moisture to remain and, therefore, the danger of short-circuiting is removed.

While he was on the cleaning topic Mr. Tate took up another subject of experiment, which he declares is a new discovery, and will be of great value to the motor dealers. He says that he tried to get this discovery patented and failing in it, decided to give it to his brethren for what they can make of it.

"We discovered," said Mr. Tate, "that you can take a hot solution of Oakite chemical, hot almost to the boiling point, and by soaking a painted car and leaving it stand for fifteen minutes and then use the cold water and air pressure, as in washing muddy cars, all the paint and grease comes off, all of it to the very last particle. Your job is done less than two hours and the saving in time and labor is easily observed when you consider that painters, by the hand methods, usually require from two to three days to remove the grease and paint from a car that is to be repainted."

The air pressure and cold water are necessary to wash and blow off the dead paint and grease after they are emulsified by the hot Oakite chemical solution.

ARRANGING FOR MILWAUKEE SHOW

Milwaukee, Wis., Aug. 9—With mid-summer passenger car trade quiet, local dealers are devoting considerable attention to arrangements for the big statewide sales promotion effort of the year, namely, the annual show of the Milwaukee Automotive Dealers' Association in connection with the Wisconsin State Fair, Aug. 30 to Sept. 4. This will be a combination truck and passenger car effort, with the commercial car this year the basis of unusually strong publicity features. The attendance at the State Fair in the last two or three years has aggregated 200,000 or more, visitors coming from cities and rural communities in all parts of Wisconsin.

DEALERS PREPARE FOR MEETING

New Orleans, La., Aug. 7—Members of the Louisiana-Mississippi Automotive Trades association are preparing for the largest and most important meeting of the organization's history at Gulfport, Miss., in October. The dealers of this section have had one of the best, if not the best, years known in the business here, and a number of them are going to tell just how they did it when they meet at the Mississippi coast resort.

Questions Oil Man on Fuel Situation

Washington State Chamber of Commerce in Annual Convention Asks Information on Shortage—Plans for Financing Automobile Sales Outlined—Automotive Merchandising Discussed

SEATTLE, Aug. 9.—The why and wherefore of the gasoline shortage, plans of financing, better roads, and greater co-operation among automotive associations on the Pacific Coast, formed the salient points of discussion at the sixth annual convention of the Washington State Automobile Chamber of Commerce held at Aberdeen.

It was the subject of gasoline, however, that held the greatest interest to the automobile dealers and, although no resolutions were passed in regard to the acute shortage of oil which has had a decidedly adverse effect on the automotive trade in the Pacific Northwest this year, the dealers unloosened a veritable flood of questions at J. L. Quinn, of San Francisco, representative of the Standard Oil Co., who came to the convention on invitation of the state chamber, to explain the gasoline situation.

Declares Shortage Not Planned

Mr. Quinn was severely grilled by the automobile men after he had finished his speech. In response to questions he denied, among other things, rumors that oil wells in California were being capped to slow production; that smaller communities were being discriminated against in their gasoline quotas; that the company was exporting vast quantities of oil at fabulous prices; that the company was withholding a fancied substitute for gasoline from the market in order to enforce a continuation of present conditions.

While many of the questions propounded by delegates during the discussion were warmly clothed, Mr. Quinn emerged without apparently giving any ground before the delegates, declaring that the

gasoline situation would gradually adjust itself and that although there may again be somewhat of a shortage next year it will by no means be as serious as this season.

Immediate relief from the shortage in Western Washington would be felt, he said, as soon as the company's new pressure plant in California began operation, and should their work meet expectations, together with the eastern and Mexican importations, the Pacific Coast will stand in a good position as far as its gasoline supply is concerned.

Assures Plenty of Fuel

Mr. Quinn vigorously declared that no one should hesitate to purchase an automobile in fear of not being able to obtain sufficient gasoline.

C. J. Garnett, of Spokane, speaking on how to remove squeaks from the dealers' organization, predicted the day was coming when pictures of accessories pointing to trouble with automobiles would be eliminated from dealers' shops. He declared that dealers should keep their repair plants as clean as milady's kitchen, separate the plant's working departments from its salesroom, adopt the best business principles of general merchandising, know bookkeeping and keep books, keep promises or not make them, and keep the dealer's banker informed at all times of the dealer's business. Many of these changes must be effected, he said, and dealers must co-operate more closely to win the greatest respect of the automotive public.

Mr. F. R. Kerman, well known financier of San Francisco, gave an interesting talk on financing and credit. Mr. Kerman described the kind of institutions that can furnish the proper credit to

automobile dealers and what that credit should be. He strongly advocated car dealers adopting a one-plan payment basis in handling cars.

"The dealer," he said, "who is in position to do a clean time-payment business can forget the cash purchasers, as three-fourths of all automobiles sold are sold on the time-payment plan. The dealer who goes after the time-payment plan business properly, intelligently, can pick up the other 25 per cent of the business. The time plan he uses can either make or break him. The automobile industry to-day is granted second place in the country in point of size; it is very complex and highly specialized.

"It is just as impossible for the banks to finance the growing needs of the industry without expansion of equipment as it would be for a manufacturing plant to produce a new development of a machine without adding the necessary equipment.

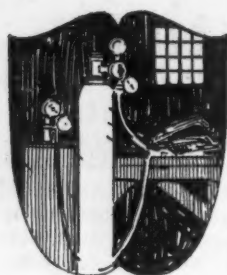
Ten Features of Financing

"Any financing plan for the dealer must involve ten features: The line of credit offered the dealer must be consistent with his responsibility; the institution offering the credit must be strong and permanent; the credit must be entirely separate and apart from local influences; it must provide a consistent plan; it must be governed by a sound and sane credit policy; there must be eliminated from the dealer's province all credit and collection bother and expense; the plan must yield the dealer 100 per cent cash and 100 per cent profit on his transactions; it must increase the dealer's sales; it must provide an ample fund; it must eliminate the indorsement risks."

Hill Climb Course That Promises Thrills



Photograph of sections of the automobile highway to the summit of Pikes Peak; America's famous and widely known mountain, whose curves and grades will test the quality of the cars contesting in the world's championship automobile hill-climb at Colorado Springs, Colo., on Sept. 6th. These races are among the most spectacular and daring contests staged in this country. In 1916, the present automobile road was built at a cost of \$300,000, after two years of construction work. This road is eighteen miles long, rises 6,695 ft. in that distance, and has an average grade of seven per cent. It is 20 ft. wide, with curves as wide as 50 ft.



Autogenous Welding

What it is and how it is applied



THIS is the fourth of a series of articles on autogenous welding and describes the proper procedure for connecting the equipment. These articles are intended to be of aid to the man who must learn the art of welding with little or no personal instruction. They also are intended as a reference for the man attending a welding school. It is likely that during the first few months of his instruction many problems will come up that may be solved more readily with these articles on hand.

Finally, this series should be of benefit to any automotive service man or repairman, even though he never intends to have a welding torch in the shop. The reading of these articles will give him an understanding of the subject which should greatly aid him in general repair work. He will be better able to decide, when he has a part to repair, whether it is feasible or not to weld it, and if so, if it will pay. The more familiar one becomes with this art, the wider the scope of its application. The man who is versed in the art will find many clever applications that one who is less familiar with the subject would never dream of. An understanding of welding principles offers a new technique to the automotive repairman.

PART IV—CONNECTING UP THE EQUIPMENT

IN starting and connecting up a welding unit let us begin with the oxygen tank. This tank usually has a bullet-shaped head covered with a metal cap which must be removed. The valve under the cap is opened slightly to allow enough oxygen to escape to clean away any dust or dirt particles that may have collected.

It is usual to furnish a two-gage regulator with this tank. Remove the dust plug from the regulator union nut and attach the regulator to the oxygen cylinder. Be sure that the connection is tight and that it will not leak.

blown out. First slowly turn on the oxygen valve until it is open as far as it will go. The oxygen pressure will show on the big gage—1800 lbs. if the cylinder is full. Then turn the hand-screw of the regulator to the right until oxygen passes through the hose. Keep turning the handle until a pressure of about 5 lbs. shows on the small or low pressure gage. After oxygen has passed through the hose for a few seconds, turn the regulator handle to the left until the flow stops.

Open the valve on the head of the acetylene tank slowly. This valve should

Water is sometimes to be found in the oxygen cylinder. Its presence may be due to natural causes or carelessness. It will harm the regulator and interfere with the flame. To guard against these possibilities, it is well to turn the tank upside down and open the valve just enough to permit the water to run out.

Fig. 11 shows a blowpipe designed for welding and intended for operation on low pressure acetylene. It consists of a tubular handle in one end of which is the valve body which carries both the oxygen and acetylene valves. On the other end is a head into which is inserted welding heads or tips of different sizes. The mixture of gases occurs in the tip.

Action Similar to Carbureter

Just behind the mixing chamber lies the central nozzle through which the oxygen issues. As it shoots from there to the mixing chamber it sucks with it a proportionate amount of acetylene which is in the chamber surrounding this nozzle. The action, therefore, is somewhat similar to that which takes place in the mixing chamber or carbureter.

To light the torch the oxygen valve is opened a slight amount and the acetylene valve all the way. After lighting the gases the oxygen valve should be opened wide and the acetylene valve then closed until a neutral flame is obtained.

To shut off the torch for a short time turn the hand screws on both the oxygen and acetylene regulators to the left until the flame goes out. Then close the blowpipe valves.

When the day's work is completed and the apparatus is to be put away, first close the acetylene valve, and then the oxygen valve of the blowpipe. Then turn off the valves on both cylinders. Then open the valves on the blowpipes until all the gas in the regulators and hose passes out of the blowpipe into the

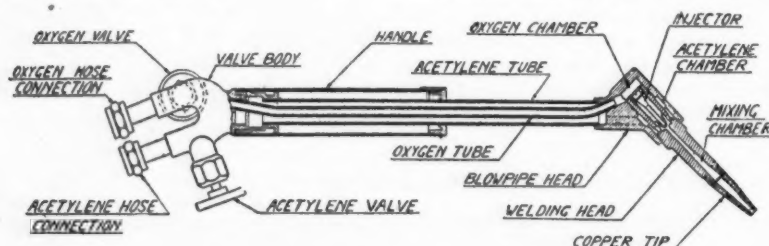


Fig. 11—Blowpipe designed for welding and intended for operation on low pressure acetylene

It is common practice to use two colors of hose, black for acetylene and red for oxygen to prevent interchange.

The valve on the acetylene tank should be blown off in a manner similar to that described for the oxygen tank. With each outfit is furnished an adaptor which is a small curved brass connection linking the tank to the regulator. The adaptor is fitted to the valve and then the regulator is attached to it.

The acetylene regulator is usually the same design as the oxygen regulator, except that the gages on it are for low pressure and it is usually painted black to conform to the color scheme.

After all hose is connected it should be

never be given more than two full turns. The pressure on the acetylene tank will show on the big gage—about 250 lbs. when the tank is full. The hand-screw of the regulator should then be turned to the right until a small amount of acetylene passes through the hose. Care must be taken that no fires or flames are near at the time or the acetylene might become lighted. The gas is allowed to flow through the hose until all dirt is removed and then the valve is closed.

The blowpipe may now be connected to the hose lines. First connect the oxygen hose to the hose connection on the blowpipe marked oxygen, and the acetylene hose to the connection marked acetylene.

Table Showing Rates at Which Metal Plates Can Be Cut Using Acetylene Flame and Pounds of Iron Wire Necessary to Weld Plates Together

Thickness of Metal Inches	Size of Weld Head	Oxygen Press. Lb. Sq. In.	PER HOUR				PER LINEAR FOOT		
			SPEED		GAS CONSUMPTION		GAS CONSUMPTION		Lbs. Iron Wire
			Best Condition Lineal Feet	Shop Practice Lineal Feet	Oxygen Cu. Ft.	Acetylene Cu. Ft.	Oxygen Cu. Ft.	Acetylene Cu. Ft.	
1/64	Mod. G.	5	30	26	3.5	3.3	.14	.13	
1/32	2	9	26	22	4.5	4.2	.20	.19	.005
1/16	3	10	21	17	6.6	6.2	.39	.37	.01
3/32	4	11	17	14	8.7	8.3	.62	.59	.02
1/8	5	12	14	11 1/2	10.8	10.2	.94	.89	.04
3/16	6	14	11	9	15.0	14.2	1.67	1.58	.08
1/4	7	16	9	7	19.2	18.3	2.74	2.62	.15
3/8	8	19	6 1/4	4 1/2	27.6	26.3	6.13	5.85	.3
1/2	10	21	4 1/2	3	36.0	34.3	12.00	11.4	.6
3/4	12	25	2 3/4	1 1/2	52.8	50.4	35.20	33.6	1.4
1	15	30	2	1	69.7	66.3	69.70	66.3	2.4

This table prepared by The Oxyweld Co.

air. Then turn the handscrew of both regulators to the left until loose. Disconnect both oxygen and acetylene regulators from the cylinders. Each regulator has a dust plug which is to be put on its cylinder connection during all the time the regulators are not connected to the cylinders.

Place the regulators and blowpipes with wrenches, goggles, heads, and tips in their proper place so that they will be safe and protected from dust, dirt, and rough handling. Roll up the hose and put it in the case or tool box where it belongs.

When the oxy-acetylene flame has just the right proportion of each gas it is called neutral. This is indicated by a clearly defined central cone, bright blue-

In Next Week's Issue

Using the Blow Torch

will be taken up and the correct method described.

These articles on Welding are vital to the service business of the automotive dealer. The scarcity in parts which is now existent can be helped out by the rehabilitation of the old parts and in the case of broken parts, Welding is an important factor.

ish-green in color surrounded by a bushy, weak flame purplish yellow in color. When too much oxygen is used, this central cone or jet becomes bluer in color and loses the greenish tinge and it is not so clearly defined.

When too much acetylene is used the jet becomes bluish white and is streaky. The neutral flame should always be employed. The beginner should test his flame from time to time as he is welding, by turning on a slight excess of acetylene and then trimming it down so that a neutral flame is produced.

Several sizes of welding heads are supplied with each blowpipe. Each of these heads gives a certain size flame and so each is for a different thickness of metal.

New Marmon Speedster Built Exceptionally Low

ONE of the smart appearing offerings of the season is the new Marmon speedster, a body development for the standardized chassis of the Marmon 34. Making use of the inherent lowness characteristic of the Marmon unit type frame, this car is exceptionally close to the ground. The same radiator and bonnet contour, familiar to the Marmon, is carried out in this car. The bonnet is slightly lower than in the standard touring car, but the essential appearance is the same.

Total Height 70 3/4 In.

The total height of this car is but 70 3/4 in. With the long wheelbase of this car, 136 in., and the body carried between the springs, there is no overhang, either front or rear, the car is given good road ability at high speeds. And as regard speed, this car is not slow for it can do better than 80 m.p.h. Barney Oldfield set the pace at the last Indianapolis race with one of these cars, which attests to the car's speed ability.

The rear deck of the body is of the turtle deck type. A large space is provided within the rear, for luggage and a side door permits of easy access to in-

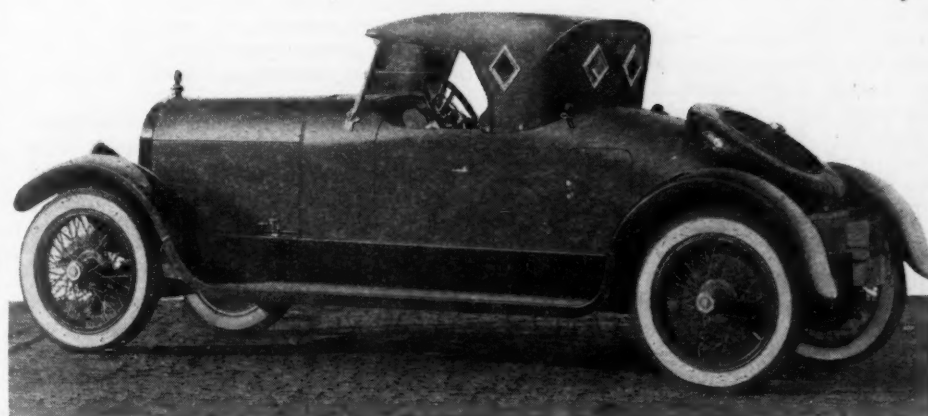
terior. These doors when opened on both sides at once give a view through this compartment. The body is of aluminum. The seating arrangement is for two passengers with the seats of the semi-bucket type. That is, a modified racing type seat is employed, with low arm rests provided.

The car weighs 3,500 lbs. A high gear ratio of 3 to 1 is used and the powerful

engine combined with the light weight gives the car a tremendously fast acceleration. A 20-gal. tank is carried in the cowl, which is standard with Marmon. Wire wheels are standard equipment.

TRACTOR SHOW AT BLOOMINGTON

Bloomington, Ill., Aug. 7—The Bloomington Automobile & Tractor Association will stage a tractor demonstration on Aug. 21 upon a farm of 100 acres east of this city.



The new Marmon speedster can do 80 m.p.h. and is slightly lower than the standard touring model

A Department of BETTER BUSINESS



Conducted by Ray W. Sherman

Use Old Ouija

Here is an idea which, so far as we know, has never been tried, but it sounds interesting and practical:

Construct an ouija board with a well castored, smooth running pointer, magnetic coils beneath the letters, and a magnet in the pointer end of the moving indicator. Place a large black covering of velvet or any other suitable material on the salesroom floor in the window. Mount the board on this black rug and run the wiring to some point where the operator can see the board but cannot be seen by those outside the window.

The board can say anything desired. It can point out to observers the merits of the cars on the floor, it can set forth advertising and sales points and say anything. The greatest value would, of course, be in the publicity that would be secured rather than in what was said.

The idea could be used in an accessory window as well. If you try this idea send MOTOR AGE details of how it works out. The idea is suggested by an electric board recently used at a sales convention.

Uncover the Grouches

Once upon a time a dealer in an eastern city got to wondering about all his owners. He wondered if some of them weren't thinking about buying new cars, and if they were all satisfied with the cars he had sold them.

Wherefore he sent to the entire list a letter, asking each owner how he was satisfied with the car, how he liked the service rendered by the dealer, and just how his disposition was on this particular morning.

Out of the replies the dealer culled some fine testimonial letters—AND some fine knocks. He found a few owners who were sorry they had ever seen the dealer, who declared the car the worst piece of cheese ever manufactured, and who wouldn't own another one on a bet.

These grouches the dealer began work on at once. He found that most of the trouble was due to a trivial matter, to a rattle, a squeak, an uncivil word by an employee or some other little thing that had grown big when nursed in the mind of the car owner.

It wasn't much trouble to straighten these things out, and most of the knockers were turned into boosters. The odd psychology of it all was that—like all grouches—when brought out into the light of day they speedily disappeared,

for it is a truth that the way to get on friendly terms with a man who is sore at you is to provoke him to wrath and let him run down. When he gets it out of his system he is generally sorry he was so abusive.

In this wise the dealer repaired his broken fences and several future sales were traceable to the plan.

The Underworked Postage Stamp

Nearly every dealer and garageman has a certain number of customers on a monthly account basis. To these customers must go monthly bills.

Nearly every one of such dealers and garagemen should maintain a department

MONEY AND IDEAS

You know, folks make money by doing things. Before they can do things they must think of things to do. And before the things they think of can make money there must be created a habit of putting these thought-of things to work.

This department is designed to give the greatest number of money-making ideas to the greatest number of people. It is a pleasure for one business man to give a helpful idea to another. But—in addition to the pleasure that comes from helping a competitor make money, Motor Age will pay you one dollar for sending any acceptable ideas.

for the sale of accessories and supplies.

And the postage stamp that carries the monthly statements can just as well as not carry along a little folder, or booklet, or letter, or something advertising some accessory.

It costs nothing to mail the literature, and it brings some business. Every little item of business brings some profit and is worth taking.

How would this plan fit your business?

Know Your Ads

A serious hitch develops in some sales organizations because the big advertising idea of the company is held under the hats of a few people. The man who writes the advertising knows what's being said, but the salesmen and the others who have contact with the public aren't as well posted.

When they're not posted, here's what blesome argument follows the sale when

may happen: A prospect reads in an ad that the car has wonderful riding qualities because of its cantilever springs. The idea appeals to the prospect and he enters the salesroom door with his mind all full of cantilever springs and riding qualities.

The salesman, not having read the current ads, or not having been posted by the dealer on the advertising plan, starts talking about the engine or the finish or almost anything. If he hits on the riding qualities it is plain luck.

The result is that there is a sad hitch in the plan. The advertising has been wasted unless the prospect can switch the salesman to the springs and riding qualities, which is wrong, because the salesman should be the leader and not the prospect.

Two things should be done: 1—All members of the organization should read the advertising of the company. 2—The company, by bulletins and letters or by meetings, should post every member of the organization from the boss to the door man in the shop on what is being done in all promotive lines.

Type Your Name

Have you ever had replies to your letters addressed to almost any name under the sun except the name you were given when you began life? And have you ever wondered if there wasn't some twist you could give to your signature so people would know what it was when they saw it?

One sure way—and a good one in all cases—is to have the name of the man who signs the letter typed down in the corner where his initials and those of the stenographer are usually placed.

It is as much satisfaction to the recipient of the letter to be able to decipher the name as it is to yourself to have your letters come back properly addressed.

Morris Adler Says:

Morris Adler, who has made money for several years in Quincy, Ill., dropped into town the other day and expressed some of his very pointed ideas.

He said that many dealers are making their own way very hard by mixing up the matter of the car price. He says some dealers are still advertising and selling the car on the basis of the list price, which means that a long and trou-

the dealer tries to explain all about the freight and war tax. Adler says the only way to do is to add up the list, the freight, the war tax and anything else that is necessary and sell the car for a flat price, f. o. b. home town and not f. o. b. factory.

He also says he gives away no free service to amount to much. What he does do is have the car come in ten days after its delivery. It is checked over for running condition and an effort is made to make sure the owner is getting satisfaction.

He says many dealers still are afraid to ask cash for shop work. Just why, he doesn't pretend to know. His system is to have the bill all made out and ready

for presentation by the time the customer is ready to go out the door. This makes collection easier. Delays in presenting the bill make it difficult.

How Many Calls?

How many times should a salesman call on a prospect before giving him up as no good?

It depends a great deal on the character of the dealer, on his system of operation, on the way he works at other jobs, on his intensiveness—and everything.

However, there is one dealer in a medium-priced car class who says: "Three times. If we can't sell them in three calls we quit—unless there's a good reason for further calls."

His idea is that his sales force should be trained to work intensively, to make every call a real sales call and not a social function, and that the salesman who can't come very close to putting the sale over in three 100 per cent efficient calls will cash in better in the long run if he starts on a fresh prospect and begins all over again. And he speaks real sharply to the salesman who doesn't come through under this plan. To those who do come through, Christmas brings a substantial bonus.

The system might not work well with a dealer of a not-so-rapid temperament. If the idea is one that appeals to you it probably would work in your business. If it doesn't appeal to you it won't work.

Just a Little Bit of Window Makes the Trade Come In



NEARLY every garage has a window of some kind. The fact that the garage is on a good street and has a window is one of the reasons why the rent is as high as it is or why the property is worth so much money.

Every garage which has such a window is throwing away part of the rent or is letting part of the property value lie idle if the window is not used. It is like renting a room in a hotel and then sleeping in the hall.

Cash in on the window.

FIRST—Clean it up. Wash the glass inside and out and make it shine. Don't let the wife at home have anything on you in the window cleaning line.

SECOND—Clean the floor of the window. Make it spotless. Make it so clean you can sit in it with your Sunday suit and not get your clothes dirty.

THIRD—If the window has no background, make one by nailing up some pieces of 2x4, or board or pieces of wire and fastening thereto some fibre board

or plain crepe paper—anything to furnish a background of a pleasing color. If you use crepe paper you can change the color from time to time.

FOURTH—Study the two designs on this page. They are for typical small-sized window, such as exist in many garages. There are two general ways of placing large and small display objects. In the window at the left the large objects are at the outside. In the window at the right the arrangement is reversed. For the large objects a tire can sometimes be used, provided it is suspended or boosted up to the necessary height. Or, fibre board signs can be used, lettered with some appropriate seasonable motto. The small objects can be any which are of a suitable size to fill in.

FIFTH—Don't crowd the window. Leave lots of room.

SIXTH—Use price cards and sales mottos. Don't get the idea that you can't make cards. If you sketch them roughly and don't try to do a regular

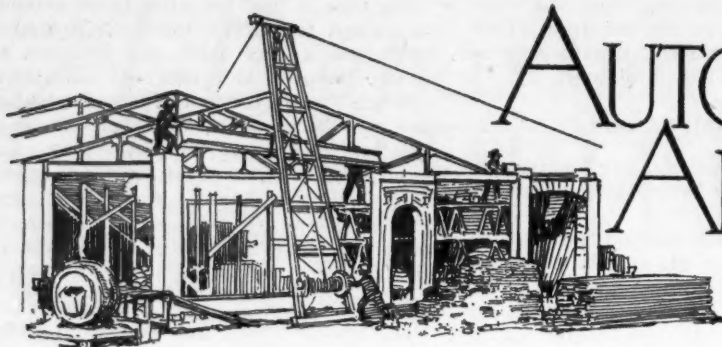
sign painter's job there will be a certain attractiveness in the rough work which will make the job good enough.

SEVENTH—Arrange several concealed lights, such as are in department store windows. Put them where they throw a strong light but don't hit the observer's eye. You can readily make your own lighting troughs. If you want *MOTOR AGE* to suggest designs, just say so.

EIGHTH—Use goods which are in demand at the present time. If it's a rainy day use chains and such things. If a hot day, show radiator thermometers. If a week end, show touring and week-end articles.

NINTH—Ask folks who stop if they don't need something. And, inasmuch as the window has done the introductory work, be nice to those who inquire and act as though it were a pleasure to sell things.

TENTH—CHANGE THE DISPLAY NOT LESS THAN ONCE A WEEK.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER



No. 254

PRIVATE GARAGE FOR SIXTY CARS

We are planning to erect a private garage on a lot of dimensions similar to sketch enclosed. We would like to have provision made for a store room for tires and parts, a work shop of a size suitable to handle three or four cars at a time, men's toilet, heating plant, etc.

At this time we do not care to have a second story built but we would like to have the first floor planned in such a way that a second story could be added later on as our growth demanded expansion. The space required at present is for sixty cars. The heating plant could go in the basement.—Indian Territory Illuminating Oil Co., Bartlesville, Okla.

We have been unable to get in the sixty cars that you requested but as the plan stands there is room for fifty-five with ample aisles and until the elevator is installed two or three can be kept in this space. Several could be stored along the main aisle at night so that you would have no difficulty in disposing of sixty cars and probably more, with every one accessible.

The arrangement of posts shown are such as they would be in the finished building. It would probably be better to install them permanently, using them to support the roof which may be raised on jacks later and another floor added in its place.

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and readers are urged in asking for such plans to be used to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

Advantage is taken of the irregular space at the back for the shop location as this would not be suitable for storage purposes. As there is no chance for window lighting here, skylights would be necessary. When the second story is added, the light would be cut off, making it necessary to move the shop to the second floor or leaving that part of the building only one story high, ending the building at the line of posts X-Y-Z.

Instead of the post arrangement we have selected, your architect might prefer to space them closer together, making the construction lighter as shown at A-B-C, A-B-C.

The heating plant could be in a small basement, probably best located under the shop and supply room and reached by a stairway in the shop.

No. 255

STORAGE BUILDING WITH BALCONY OFFICE

I should like some suggestion for a floor plan of a garage to be built on a lot 60 by 165 feet. The garage is to be primarily for storage purposes and is to be a one-story, fireproof building. I want a small showroom to hold two cars, accessory show space, office, small parts and accessory stock room and rest room. I have no particular objection to elevation of the office, as space is the most desirable part of the arrangement.

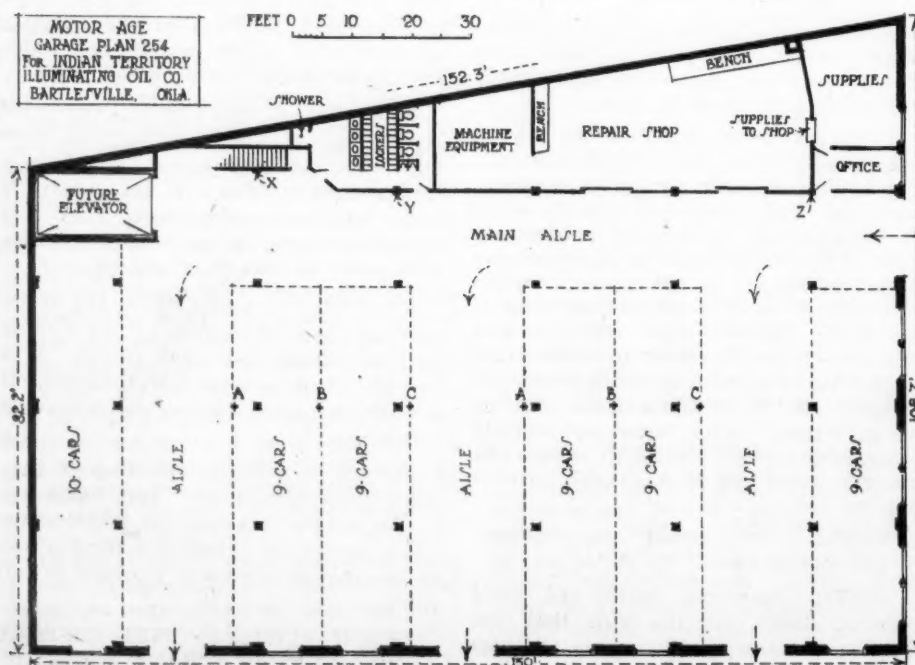
Will need a small shop and thought partitioning off the back end of the building would make a very nice shop and washroom. My idea is to arrange this all in as compact a form as possible on the left side so that seventy-five cars could be stored.

A building of this construction requires posts, but believe if they are put in just the right place it will reduce their objectional features.—F. V. Williamson, Minneapolis, Minn.

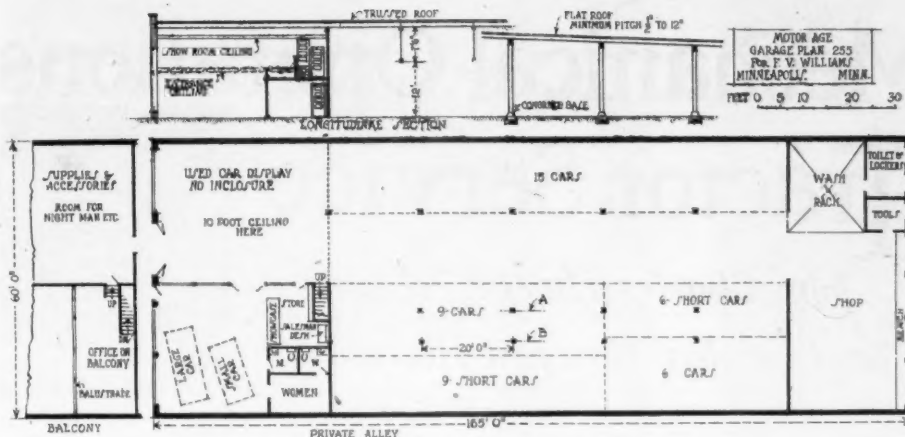
You are too optimistic regarding the capacity of your contemplated garage. We would advise limiting the number of cars to be stored to two or three less in order to give plenty of space in your shop and show and also to avoid the appearance of being jammed in.

But a provision for storage space to accommodate seventy-five cars is entirely out of the question. Using the space to the best possible advantage and considering one-third of the cars as Fords, one-third medium sized and one-third medium or large it would only be possible to store forty-five cars.

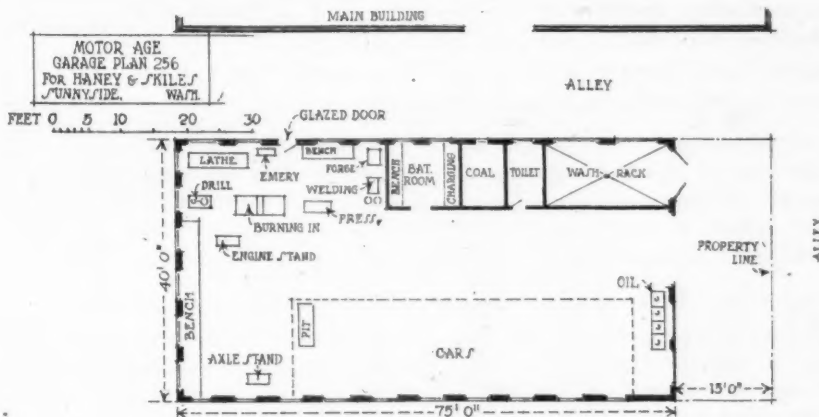
If you partition off your used car display room, the room will be so small that one couldn't get in to see the cars. It would be better to either leave out the



No. 254—Private garage for sixty cars



No. 255—Storage building with balcony office



No. 256—Detached service shop

partition or cut down the aisle to 10 ft. making the room about 20 ft. deep. We would favor the former scheme as a 20 ft. room is really too small in which to show cars and with the unenclosed space it can always be used for storage during a rush or when there are no used cars on hand.

Twenty feet on centers is about the minimum spacing for posts; that gives a little over 19 ft. for three cars depending on the size of the posts. Trusses would give much more freedom for car movements. The line A would be best for posts considering construction but line B would be best from the standpoint of car storage.

It would be a good plan to use the space over the entrance passage and used car space for supplies and accessories, building this whole front section up high enough for the purpose.

We have not considered the alley as an entrance, because you have not said anything about it, but by closing up the front entrance and making an entrance and exit on the alley, a much more impressive front arrangement could be had and storage space increased slightly.

No. 256

A DETACHED SERVICE SHOP

We are enclosing a rough sketch of a proposed service station for Dodge cars, which we expect to build just across the alley from our present building. This station will be 40 by 60 ft. in size.

We want a washroom, some oil tanks, small coal bin, work bench, rack, a pit in

a convenient place, the necessary air tanks, drill press, battery bench, lathe and the necessary equipment for an up-to-date Dodge service station. We will not display any accessories or tires, as we have a room in our main building for that purpose. We do not intend to do any vulcanizing.

While we have 75 ft. in length, we figure on the front 15 ft. in connection with the 16 ft. alley to make it convenient to drive in and out.

We would like to have you advise the proper location for the equipment, tools, etc. We will have light on all four sides,



Two models of the new Olson spark plug

so do you think it necessary to have a skylight?—Haney & Skiles, Sunnyside, Wash.

We have made what we consider a good arrangement of shop equipment and though we have not adhered to your suggestions, it is only because your ideas do not make for simplicity.

By keeping all the machines and other interests grouped along one side of the shop, the other side is left free for the unhampered movement of cars and for repair activities.

One or two skylights would undoubtedly help out and be of benefit unless there is good open space all around the building.

Olson Spark Plug

THE Olson spark plug manufactured by the Wm. O. Olson Co., Manhattan Bldg., Chicago, is one that incorporates the latest ideas of spark plug design. Mr. Olson, who has designed several spark plugs of acknowledged merit, being sold under various trade names, is now producing his own spark plugs.

One of the unusual features in connection with this plug is that the outer electrode, which is constructed of a high nickel manganese steel, is a steel stamping—not a wire electrode welded or soldered or pressed into the outside shell. This stamping is circular in form and is rolled into a shoulder in the shell, thus giving it a large area through the excess heat which is transmitted to the shell and thence dissipated out. The insulator is of stone and successfully withstands all attempts to break it under stress of high temperatures and sudden plunges into cold liquids.

A special model is made for the Ford car, listing at \$1, and the regular 15/16 in. hexagonal shell model also lists at this price. A special heavy duty model is made which lists at \$1.25. Various types of insulators are also offered. The conical shaped and the petticoat type, thus giving a variety that are adaptable for all types of engines.

FAVOR CARLYON ROAD BILL

Seattle, Aug. 4—Definite plans are being completed by the Washington State Good Roads Association for launching an extensive publicity campaign on behalf of the so-called Carlyon road bill, introduced in the last Legislature and referred to a vote of the people this fall. The bill provides for raising funds to pave 1,500 miles of state roads by bonding the automobile licenses. According to those who are backing the bill it will not be necessary to increase the license fees.

It is declared by members of the executive committee in charge of the campaign that this measure is the only practical plan ever presented to voters of this state for the solution of the good roads problem. By the terms of this bill automobile license fees would be bonded and the 1,500 miles of highway reaching 29 counties and serving 90 per cent of the population of the state would be hard surfaced. This, it is estimated, would be accomplished in six years.

Standard Mechanical Operations in Tractor Service

by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

THE article herewith, while part of the series on Standard Mechanical Operations in Tractor Service, is, nevertheless, applicable to the entire field of automotive service work. Valve mechanism basically is not very much different in a tractor than motor car or truck engine, consequently what is said here applies in a large measure to any vertical cylinder internal combustion engine.

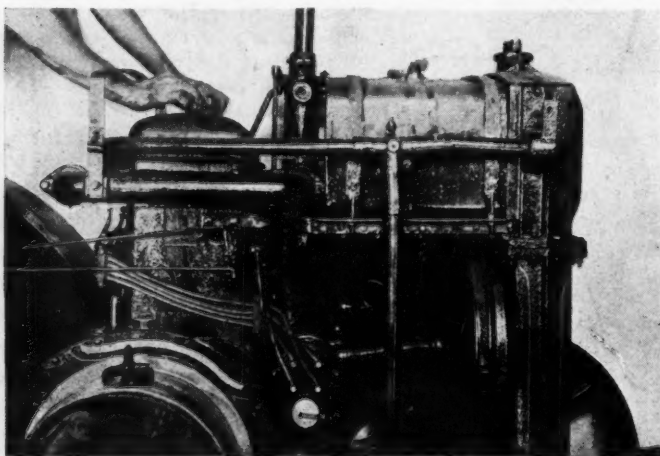
The valve mechanism of an engine is one of the prolific sources of trouble and nothing will throw an engine out of efficient running more quickly than improper functioning valves. Automotive dealers and repairmen will do well, therefore, to read and study carefully the article herewith and those that are to follow, so that mechanics might get the benefit of properly making valve repairs and adjustments.

In studying this series of articles it is well to bear in mind that the authors have given much study to the question of motion and time. In other words, the operations have been worked out so that minimum effort and time is required to do the work. Often much time is wasted by mechanics doing unnecessary work on a job, which job if intelligently handled could be done in half the time.

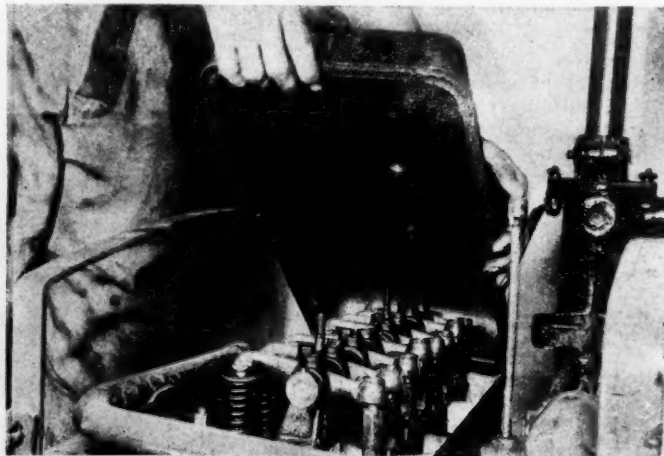
THE fundamental principle governing the design, construction, operation and maintenance of the valve mechanism of an internal combustion engine is that a full charge of the fuel mixture coming from the carburetor shall find its way quickly into the combustion chamber, be fired and burned into a highly volatile gas and after doing its work, shall be expelled as thoroughly and quickly as possible. It is thus apparent that both intake and exhaust valves shall be as large as practicable, consistent with the size of the engine, and that they shall be opened and closed, not only at the right moments, but as quickly as practicable. It is also apparent that the opening for the intake and exhaust of the gas will be influenced by the lift of the valves, that is, the distance they are raised from the valve seats.

In order that the operation of the valves may be efficient, the entire valve assembly must be clean, well lubricated and actuated without lost motion or "play."

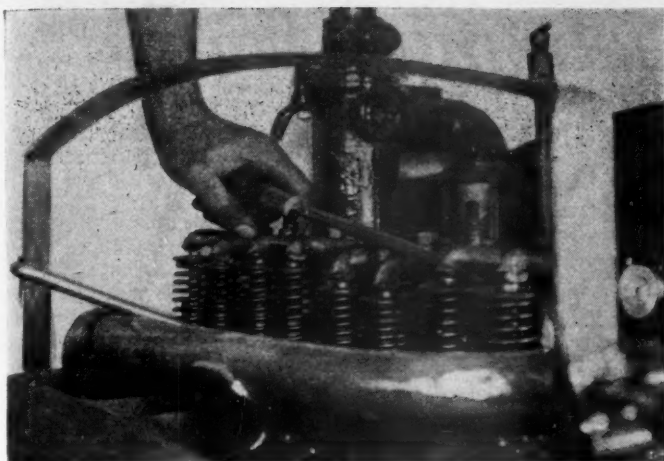
Sticky Valves—It sometimes happens that the engine misses fire and the test and inspection of ignition and carburetion fails to locate the trouble. An inspection of the valve mechanism will find a valve sticking; that is, some condition has arisen to prevent the valve opening and closing properly, despite the mechanical devices that are used to maintain such action. The valve stem has been so "gummed up" with carbon that it will not operate freely. This deposit, usually of carbon or dirty oil, has gradually accumulated on the stem until it adheres firmly to it. The valve sticks shut, or open, so that the fuel charge cannot enter the combustion



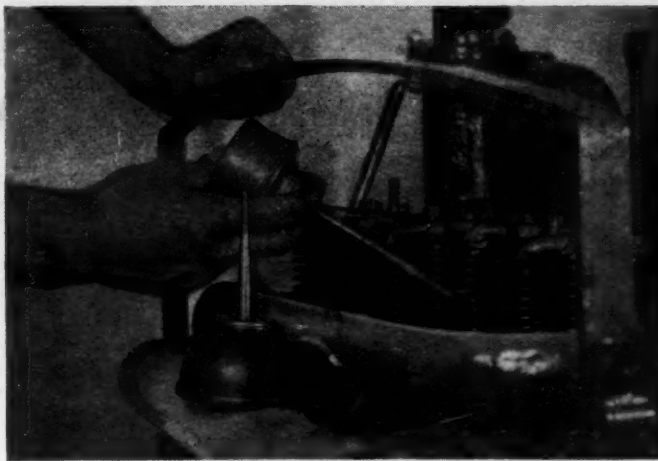
1—Locating and freeing sticky valve. With engine running, remove cover over valve chamber, by unscrewing knurled thumb nuts as shown in view



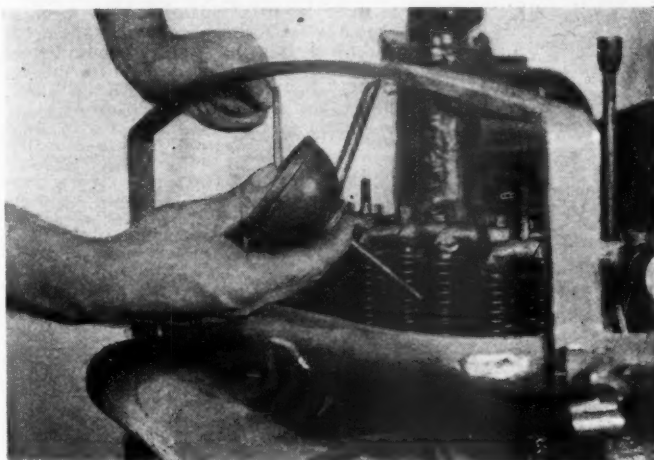
2—Care should be exercised in taking off the cover plate so that the operator's hands or clothing will not be caught in the rapidly moving mechanism



3—Observe sticking valve by noting the valve action. Loosen valve by using a heavy screwdriver as a pry, in the manner indicated in this view



5—After the valve is observed to operate freely and has the appearance of being thoroughly cleaned, it should be lubricated thoroughly by squirting a liberal quantity of engine oil on it, using another squirt can, as shown



4—Clean the gummed surface of the valve stem by squirting kerosene liberally upon it, using an ordinary squirt can as indicated in this view. The kerosene will not harm the mechanism in any way, so it may be used freely—

chamber, or if it enters, cannot be compressed to its ignition point. This, of course, results in the engine missing fire.

It sometimes happens that an exhaust valve will be found to be sticking open due to being warped by excessive heat developed in the engine by running with insufficient or poor oil, or with an insufficient supply of cooling water. Poor carburetor adjustment or faulty ignition will contribute to the same condition. It will be seen that the only adequate remedy for this is the replacement of the warped valve with a new one. The method for this operation will be described subsequently.

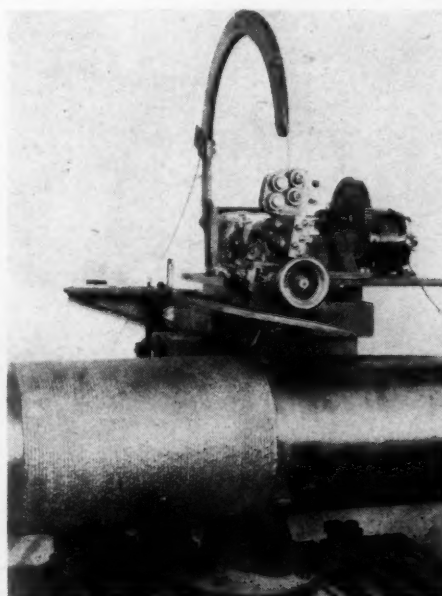
Aircraft Association Seeks Information

New York, Aug. 9—The Manufacturers Aircraft association has sent its mailing list a questionnaire from which it is hoped that a compilation may be perfected of the commercial aeronautic activities of the country. This interest has been changing and growing so rapidly that it is feared that inquiries may not reach all persons or organizations concerned in this new enterprise and an invitation is given for information from all sources. The questionnaire solicits information of companies and municipal enterprises. The address of the association is 501 Fifth avenue, New York.

General Electric Arc Welder

AUTOMATIC arc welding can now be accomplished by a new device perfected by the General Electric Co. and soon to be put on the market, which is known as the Automatic Arc Welder. This welder, for use with the regular welding set, is designed to take the place of the hand controlled electrode. It consists of a pair of rollers, called feed rolls, driven by a small direct current motor, which draw in, and deliver to the arc a steady supply of wire, and automatically maintain the best working distance. The whole is controlled from a small panel.

The welding head is held by a suitable support with a certain amount of hand regulated adjustment, and consists of a steel body carrying feed rolls and straightening rolls which are both adjustable for various sizes of wire. The arm is supported on a gear box, together with the motor. This box contains gears which give three gear ratios, thus ex-



Rebuilding a worn shaft with the General Electric arc welder

tending the range of the device while allowing the motor to operate at its most favorable speed.

The control panel carries an ammeter and voltmeter for the welding circuit, as well as rheostats, a control relay, and the contactors and switches for the feed motor.

Valuable for Routine Welding

The whole apparatus is mounted on a base which can be bolted to any form of support. Thus a great variety of working conditions can be met, but provision must be made for carrying the arc at uniform speed along the weld.

The device is especially valuable where a large amount of routine welding is to be done, since it is capable of from two to six times the speed possible to skilled operators and gives a uniform weld of improved quality. It is adaptable to welding seams to tanks and plates, rebuilding worn or inaccurately turned shafts (as shown in the illustration) rebuilding worn treads and flanges of wheels, and many other kinds of work.

The Readers' Clearing House

Questions and Answers

DODGE CLUTCH

Q—A 1915 Dodge car growls when shifting gears. Investigation shows that the cone clutch stops too easily. It appears to rub on the throw-out fork which stops its turning. Give adjustment to stop this.

2—Does the 1916 Dodge with disk clutch have a brake to stop its spinning? This clutch can not be made to stop by holding clutch pedal down?—T. L. Scofield, Millbrook Garage, Millbrook, Ill.

1—This growling noise when shifting gears is probably due to the clutch yoke or release bearing becoming dry on account of the grease tube becoming blocked. When the yoke becomes dry in this manner it acts as a brake and stops the clutch the moment it is released, thereby making it impossible to disengage the gears in the gearset. The best way to eliminate the trouble is to have a new clutch yoke installed, as after the two flat surfaces comprising the clutch yoke are burned, they will be liable to give this trouble again.

2—Slipping of the multiple disk clutch in the Dodge car may be due to a weak clutch spring, but cases of this kind are extremely rare. The compression on the clutch spring can be increased by moving the clutch retainer washer forward a notch on the clutch shaft. The semi-circular clutch spring retainer can be moved forward a notch on the clutch shaft after the clutch spring has been compressed, by inserting two long heavy screwdrivers on two steel bars in the clutch case, and prying the clutch release forward. The moving of this washer can be accomplished by the use of long nosed pliers. If the clutch facings have become glazed or greasy, the disks can be held apart and a solution made up of one tablespoon of powdered rosin in a pint of turpentine squirted on them. Work the clutch pedal back and forth until the turpentine has had a chance to cut into the facings and dry out. Where the heads of the rivets which hold the fabric to the disks are found to interfere with the driven disks, they should be hammered down. The disks slide easily on the pins. See that the pins in the fly-wheel and clutch housing are parallel, or if necessary, enlarge the holes in the disks slightly. Care should be taken not to enlarge these holes too much as this will cause the clutch to rattle.

CLUTCH STICKS

Q—The clutch which is situated between the flywheel and gear case on an Abbott-Detroit model B44 will engage all right after repeated efforts, but after being engaged it is utterly impossible to have it disengage itself. We have tried adjusting the four nuts which appear on clutch collar upon detaching cover of clutch case but without results.—Sal. A. Ruiz, Gretna, La.

We take it from your description that you refer to throwing the clutch out and

CONDUCTED BY ROY E. BERG

Technical Editor, Motor Age

THIS Department is conducted to assist Dealers, Service Stations Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues.

MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

CLUTCHES—GEARS

disengaging it again. In other words, the condition is that when you attempt to throw the clutch out the clutch does not stop spinning and the gears have to be forced in and that after the car is in gear it is impossible to throw the clutch out and it is necessary to kill the engine to stop the car. It is possible that the disks are stuck together due to rust or an accumulation of gummy dirt or grease. Wash the entire clutch assembly with kerosene, working the clutch pedal back and forth while the engine is running so that the kerosene will work

into all of the parts. It is advisable to examine the throw of the pedal. An adjustment is provided at the junction of the pedal and the shaft. The bolts which regulate the spring tension should be turned equally in order to maintain an equal amount of tension on all sides of the disk. Since you have turned these bolts, we advise loosening them all as far as they will go and make the adjustment over again, being sure to turn all of them up the same amount.

BREAKS RING GEAR

Q—In the last four months a 1916 Davis 6 touring car has broken two ring gears and three piston gears in the differential. The drive shaft has a very little play, possibly about 1-16 in.; the differential as far as can be seen is true, it fits into hangers with caps which fits over roller bearing races. The ring gear always breaks the outside half of the teeth, the last ring gear two teeth were broken about eight to ten teeth apart and the outside half of each tooth. The first gear that was broken one tooth was broken out and four or five were chipped a little. What could be the cause? The car is equipped with a Continental 7W engine No. 5389.—H. C. Wirt, Alpha, Ill.

Fig. 1 shows a typical ring gear and pinion construction. We believe that your trouble is caused by a worn bearing indicated in the sketch just ahead of the pinion gear. The dotted line represents an exaggerated position of the axis of the pinion if this bearing is worn. The natural result is that all of the pressure is exerted on the outside of the teeth of the ring gear and consequently the teeth break off on the outside half.

CHEVROLET CLUTCH

Q—Instruct how to remove, reline and replace the clutch on a Chevrolet 490. No. 252288.—L. H. Jons, Westover, Md.

The procedure of removing, relining and replacing the clutch on a Chevrolet is as follows: Remove the floor boards and wire running from the battery to the starter. Remove the three bolts holding the V-brace to the engine base and gearbox support and remove the V-brace. Disconnect the brake rods from pedals and remove the bolts holding clutch release shaft to gearbox support and remove clutch release cross shaft, together with the pedals. Remove the bolts on rear clutch hub drive ring. Remove the four bolts holding the gearbox to the gearbox side arms. Care should be taken in removing the shims under the gearbox, so they may be placed in the same position. Remove one bolt holding the left gear box side arm (on the pedal side) to engine. This permits gear box side arm to spring to one side when removing the gear box, lift gear box up and slide it forward. It may then be removed from the chassis. A jack should be placed beneath the propeller shaft to

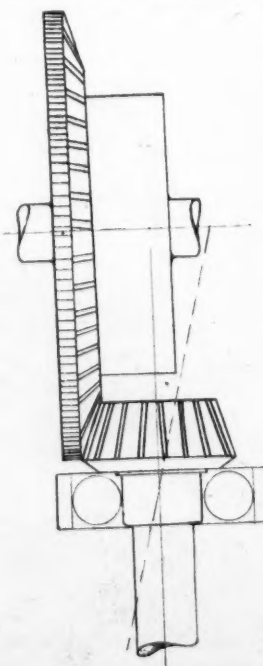


Fig. 1—Showing typical ring gear and pinion construction

hold it in place when the gear box has been removed, turn the flywheel until the hole passing through the clutch hub is at the top, and the clutch spring retaining pin is in line with the hole. The clutch spring will then have to be compressed and the pin will usually drop out when over the hole in the housing; but if not it may be driven out with a drift hammer, next draw clutch spring out, remove bolts holding clutch hub to clutch spider and remove clutch hub.

This is necessary, as the hub would otherwise interfere when removing clutch, pull clutch out. Remove nuts holding flywheel to crankshaft flange and with a bar loosen flywheel and remove. It is advisable to mark the position of flywheel on flange, so it may be replaced in the same relative position.

Remove flywheel together with clutch spring, anchor stud and place it on two boards nailed to a bench. Separate all parts and clean with gasoline and waste. Fig. 2 shows one method of compressing a clutch spring. It is best to obtain the new lining from the makers, but if this is not expedient, the old lining should be carefully removed and used as a pattern for cutting the new lining. The new leather should be much thicker than the old lining and of uniform thickness.

The most essential point in fitting the new leather is to have it fit tight and true to the cone. If the clutch has been relined it will not work perfectly until it has been worked in. This usually takes some time and during that period should receive frequent application of neatsfoot oil. To fit in new leather, soak the leather in water, then secure one end of the leather to the cone by one copper rivet (rough side out). With only about three-quarters of leather on the cone, pin the other end to the cone by a rivet as shown in Fig. 2, force the leather up into the cone. It should fit evenly and with uniform tension. Drill and countersink the rivet holes, rivet the leather in place being certain that rivet heads are 3/32 in. below the leather and well headed on the other side. Allow the leather to dry slowly, as otherwise it will shrink too much and expose the rivets.

The assembling record is as follows: Lift flywheel back into place on the engine. Bolt it back in the same position as removed. Do not tighten any one bolt until all are drawn snug. This removes the possibility of having the flywheel out of true, which would ruin the thrust bearings. Remove the pin and three old valve springs from the clutch spring anchor stud. Force the clutch back into position. Bolt clutch hub to clutch spider. Draw all bolts up snug, before any one is tightened. Put clutch spring black in place and pack with grease. Using the compressor shown in Fig. 2 replace the clutch spring retaining pin. Lift gearbox back into frame.

It will have to be sprung past the gearbox side arm. Replace bolt holding gearbox side arm to engine. Replace the bolts on rear clutch hub drive ring. Bring all up snug together. Replace bolts holding gearbox to side arms. (Make certain that the shims are re-

TO assist readers in obtaining as a unit all information on a certain subject **MOTOR AGE** segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

CLUTCHES, GEARS, ETC.

T. L. Seofield, Milbrook Garage.....
Sal. A. Ruiz.....
H. C. Wirt.....
L. H. Jones.....
Edw. Finley.....
H. Gauthier.....
John P. Welch.....

LUBRICATION

Adolph Montag.....
C. F. Alfrey.....

ENGINES

Walter Sixt.....
S. M. Inks.....
C. R. Algyer.....
W. J.....

THE ELECTRIC SYSTEM

Clifton B. Norris.....
John Iken.....
J. Frankovich, Utility Electric Co.....
Q. A. Rowen.....
Marion W. Smith.....
Harry L. Atlans, Sr.....
George Kraus.....

placed exactly in the same position from which they were removed.) Replace clutch release shaft with clutch yoke and pedals. Connect brake rods. Replace V-brake, connecting gearbox support with engine. Refill the reservoir on clutch yoke and grease cups on clutch cross shaft. Oil all working parts. Replace wiring. Start engine and note whether everything seems to be working properly. If there is a rattle in the clutch drive ring it will indicate that the gearbox is out of line. The shims will have to be shifted or possibly removed.

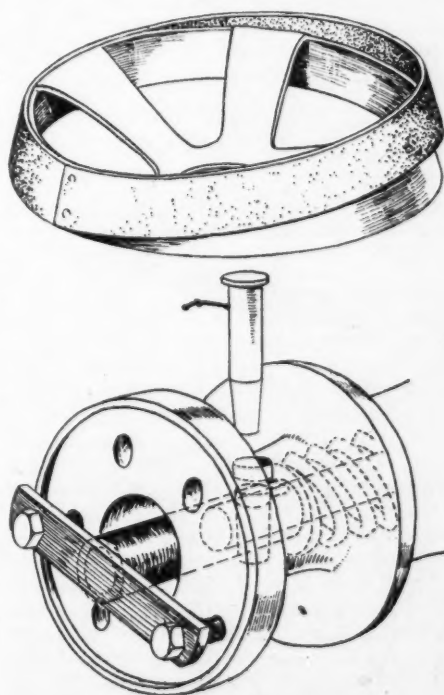


Fig. 2—Replacing the leather on the cone. Below, by use of the compressor the clutch spring retaining pin is replaced

When perfect alignment is reached the rattle will cease.

DIFFERENTIAL HUMS

Q—There was some backlash in the propeller shaft of an Oakland 19. Same was taken up by taking out lock washer and turning nut two notches. There is now a little noise or hum which seems to come from the shifting gears. At first, this nut was taken up about six notches, but upon driving, found that it made quite a hum so it was turned back, so that it has only been changed two notches. Could this hum come from the bearings in the gears or not?

2—Can castor oil which is labeled Castor Oil XXX Oleum-Ricini U. S. P. be used? It is possible to get a still cheaper grade than this?—Edw. Finley, Detroit.

1—We do not understand just what adjustment you refer to, but we believe that you have changed the pinion adjustment. By moving the bearing sleeve you have moved the driving pinion toward the ring gear too far. The natural result is a decided hum. Proper adjustment of the pinion and ring gear will eliminate the backlash in the gears. Make this adjustment first and if you find play in the propeller shaft, examine the universal joints to see if they are not the root of the trouble.

2—Castor oil can be used if you clean the engine thoroughly and use castor oil exclusively. You positively must not mix a vegetable oil with a mineral oil. Since the company does not advocate the use of castor oil, we advise following their instruction with regard to the oiling of the car.

SLIPPING CLUTCH

Q—On a Dodge car equipped with dry disk clutch slipping of the clutch is remedied by compressing the clutch spring sufficiently to allow the split washer which fits into one of the three grooves cut on the clutch shaft to be moved forward until it fits into the next groove. Publish in Motor Age a sketch and dimensions of proper tool to perform this operation through cover plate opening in clutch housing.—H. Gauthier, Roland, Manitoba.

An attempt to work through the cover-plate will prove very unsatisfactory, regardless of what kind of a tool is used because of the limited space. It is impossible to get good leverage in this manner and this is essential in compressing the spring. We believe that your supposition with regard to the proper method of remedying a slipping clutch is entirely wrong. Reports from large service stations state that very little trouble is experienced with clutch springs, but when the clutch is slipping badly it is in most cases due to grease or to worn facings on the disks. We advise washing the clutch out thoroughly with gasoline. The clutch will in all probability slip for a time until all of the grease has been squeezed out. Unless it is positively indicated that a replacement or an adjustment such as mentioned is necessary, cleaning and adjustment should always take place before tearing the clutch down.

CLUTCH TROUBLES

Q—The clutch on a 1918 one-ton G. M. C. truck sticks. Instruct how to adjust and is it a dry disk clutch?

2—Give clutch adjustments for the cone clutch used in the 1920 Oakland clutch grabs.—John P. Welch, West Haven, Ct.

This type of clutch requires no atten-

tion, except a limited amount of lubrication and an occasional adjustment of the pedal link and pedal stop. With proper handling the lining rings will wear very slowly and the clutch springs will compensate for this wear until such time as linings must be removed. By reference to Fig. 3 the clutch action is apparent. Depressing the pedal A, pushes link B forward and turns the shaft C by means of the lever D. On the shaft is the throw-out fork which through its fingers E pushes back on the throw-out bearing housing F. The pedal is raised when the foot pressure is removed by the clutch spring.

It is evident that unless the return movement is limited, the throw-out fork fingers E will come in contact with the opposite flange H of the bearing housing. This would cause wear on the flange and fingers or on the back plate of F. The spring G should pull the fingers away from F before the fingers strike H. To accomplish this result the pedal should strike the stop screw L before the fingers strike H. If this brings the pedal too high for the driver's comfort, the adjustable stop screw L may be used and the pedal set in its released position to suit the driver.

When using this stop, the length of the link B must be adjusted so that the clutch can fully engage, therefore, the pedal should move down at least $\frac{3}{4}$ in. before fingers E strike housing at F, as otherwise the clutch may be caused to

slip. As the plate linings wear, the link B will require shortening in order to maintain this clearance.

2—We believe that the grabbing is caused by dry or hard clutch leather. This can be remedied by applying neats-foot or castor oil after thoroughly cleaning the leather with kerosene, using an oil gun to remove all of the mineral oil. Clutch rivets projecting, due to wear of the leather will also cause grabbing. Remedy by placing a center punch against the rivets and hammer until they are below the surface of the leather. This trouble is usually accompanied by a grating or grinding sound. The clutch lever linkages may be out of adjustment, there may be excessive tension on the clutch spring or the clutch rollers may be worn due to lack of lubrication. In the latter case, if the rollers are absolutely dry, they are liable to seize and prevent the clutch release entirely in which case new rollers must be fitted.

LUBRICATION

ESSEX PUMP ADJUSTMENT

Q—How is the oil pump on the 1919 Essex model A adjusted? Publish sketch of same.—Adolph Montag, West Bend, Iowa.

To set the stroke of the oil pump remove plug "A" see Fig. 4. Start engine and run at idling point. Now insert end of match or piece of straight wire into plug hole. This will butt up

against the top of the oil pump plunger and move in or out with it for the full length of the stroke. Measure its travel. For normal driving this should be about $\frac{1}{32}$ in. Where excessive or extreme driving conditions prevail, it should have a travel of about $\frac{1}{16}$ in. The setting can be changed by loosening a clamp lever, which can be found directly behind the pump housing assembly. When you have loosened the lever, insert a screwdriver into the slot at the end of the oil pump regulating shaft and turn this slightly over to the right or left.

OIL PUMPING

Q—A 1918 Dodge car pumps oil badly. New Gill leak proof rings were installed and also a new carburetor as the old one failed to function properly. The cylinders seem to be in good shape. Have tried all grades of oil, light and heavy.—C. F. Alfrey, Exaxisboro, Okla.

It is certain that if the pistons are pumping oil badly, there is a misfit somewhere. In spite of the fact that you have installed new piston rings it is evident that there is enough room left to allow the oil to get by the pistons. We advise taking the engine down and making a careful examination and measurement of the cylinders and pistons. If the cylinders are found out of round or the pistons worn enough so that the installation of new piston rings will not give a good enough fit to prevent oil pumping it will be necessary to regrind the cylinders and fit new pistons and rings.

ENGINES

PISTON SLAP

Q—A knock has developed in an Essex which has been driven about 10,000 miles. Have been told this is a loose camshaft bearing. This knock can be heard at any speed but it does not seem to get any worse. It does not seem to affect the power or speed of the car in any way. All other bearings are tight and valve tappets are adjusted. This knock does not seem any louder on a pull than when the engine is running idle. Could it be caused by a loose wrist pin or a piston slap? The rear piston can be moved slightly and it pumps some oil. Give instructions for tightening loose camshaft bearings.—A Reader, Ames, Ia.

However strong the beliefs may be that the trouble is caused by a loose camshaft bearing, we do not believe that this is the case. We believe from the fact that you state regarding the rear piston that the knock is nothing but piston slap. This kind of a knock is very difficult to locate and may occur even though the piston rings fit perfectly tight. Piston slap is caused by the piston striking first one side of the cylinder and then the other. The looser the piston the greater the slap. This slap may be due to worn cylinders or worn pistons and rings. There may be two or more distinctive piston slaps during the cycle. However, it is likely that the only one that can be heard is the one that occurs when the piston shifts from one side to the other at upper dead center just as the explosion is taking place. When the piston is on the compression stroke it is in contact with the right side of the cylinder. As the crankpin swings by top dead center, the inclination of the con-

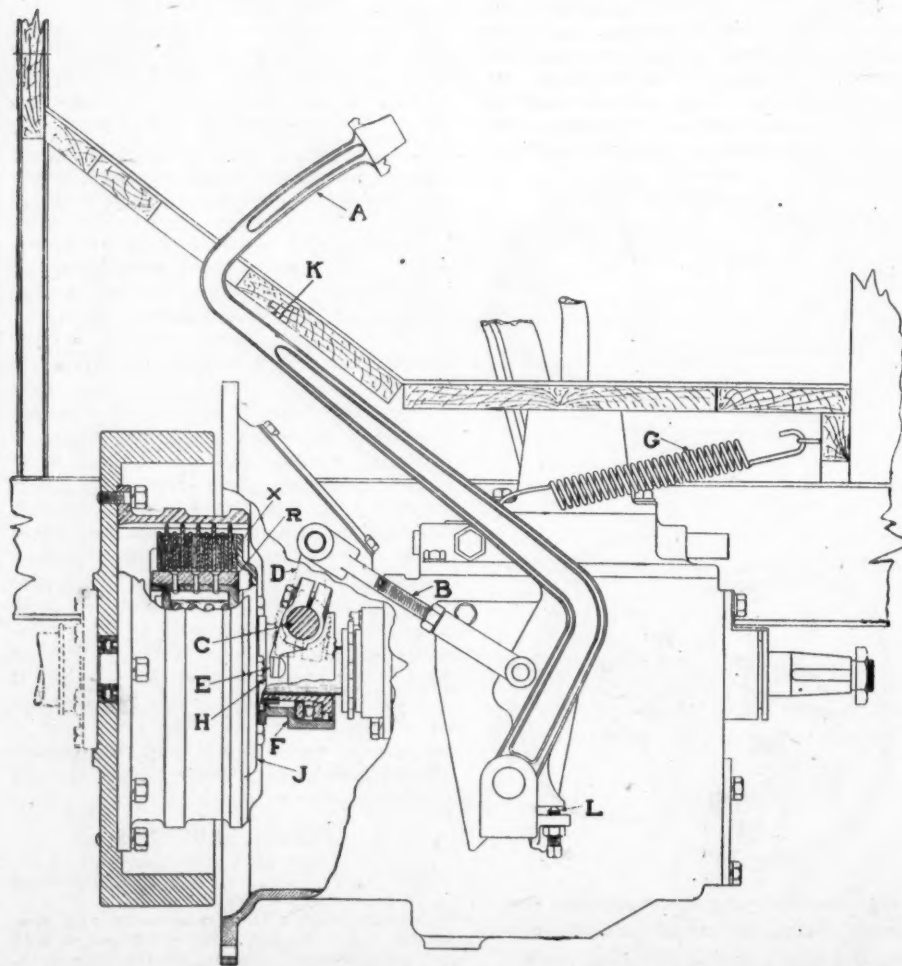


Fig. 3—Sectional view of the G. M. C. 1-ton clutch assembly

necting rod is changed from right to left, thus forcing the piston to the other side. In the case of a worn camshaft bearing we advise replacement. It is a tubular bearing and a very simple matter to slip the old one out and the new one in. In your case we advise removing the piston and connecting rod which you have found loose and line it up carefully before putting it back. If this does not remedy the trouble you can then make an examination of the camshaft bearings.

ONE CYLINDER MISSES

Q—What causes the front cylinder in a 1910 model 30 E.M.F. to miss? The valves have been ground, breaker box and distributor examined and also new wiring installed. A piece of fine wire gauze was put between the carburetor and manifold which seemed to make the other cylinders fire better but still front one misses. It runs on low or second gear but starts to miss on high or on slowing down to turn corners. High test, 65 deg. gas is used. New plugs were installed and carbon removed. Could it be getting too much air or not enough? Can start on magneto when the car is warmed up. The compression seems fairly good.—Walter Sixt, Streator, Ill.

Since this car is so old and it is evident that no changes have been made in the manifold or carburetor, we believe that the trouble is due to poor carburetion. However, weak magnets or too wide a gap between the spark plug electrodes will cause missing. If the gaps are not all the same, the plug that has the widest gap will be the first to misfire as a result of weak magnets. In the case of carburetion it is very probable that you are running on too rich a mixture. Cut down the mixture and see if that improves the running. The length of the passage through which the mixture must pass before getting to the cylinder is so great that there is plenty of opportunity for condensation. It is possible that the cylinder mentioned is not getting enough gasoline since you placed the screen in the intake or it may be that entirely too much gas is getting to the cylinder. It would be advisable to examine all the manifold connections as well.

OVERHEATING

Q—What would cause a Buick H-45, 1919, to heat on a hard pull or upon driving 40 m.p.h. The car has been driven 8000 miles and has never been overhauled. It has no knock or rattle and mechanic cannot account for heating. It has always done this. The timing and carburetor are set O. K.—S. M. Inks, Connellsville, Pa.

We believe from the description of your trouble that it is a case of running on a retarded spark at high speeds. Try advancing the spark setting and also flush out the entire cooling system. It would be advisable to examine the oiling system as well, as lack of oil will also cause overheating.

VALVE NOISE

Q—There is a marked tap which comes from No. 5 piston in the Continental engine in a 1918 Auburn. After adjusting the push rod as fine as possible by turning the push rod it will either loosen or tighten, as though the top of the nut were not true or that the valve stem was sprung. Valve stem does not seem to bind in any position. What would you do with it?—C. R. Alger, Seattle, Wash.

In the first place examine the nut to

see if the top of the nut is true. Then see if the valve stem is sprung. It is very possible that the valve guide is crooked in which case if the push rod is turned it will take up the clearance and the result will be either to bind or to loosen as in your case. Examine the valve stems carefully and see if it is not worn on one side. If this is the case it may be a result of the hole not being concentric with the valve seat—which can be remedied by re-seating in a radial drill press; the top of the valve lifter is not at right angles with the valve stem, wedging it off to one side or the same may be true of the car on the valve stem. The latter troubles may be remedied by the use of a file to true them up.

OIL PUMP FAILS

Q—The oil pump on a 1916 or 1917 Paige refuses to pump oil. Same has been disassembled and it looks O.K. also have had pipes and couplings off, they seem to be O.K. The gage on the dash has also been removed and examined but the trouble could not be located.—W. K. Milwaukee, Wis.

In the first place are all of the pipes free from dirt and has the oil screen been removed and cleaned thoroughly? Clean the oil out of the crankcase and wash it out with kerosene. When well cleaned put new oil in the crankcase to the proper level and go over every connection carefully to see that they are all absolutely tight. Start the engine and see if the pump is working. If after this, you find that the pump is working alright it would be advisable to remove the gage and see if it is in good condition. This pump is of the plunger type from all the information we can obtain and it is quite possible that the plunger is worn or perhaps the check valves are not working as they should. About the only thing we can suggest because of the lack of details concerning the trouble is that you clean the system thoroughly in the first place, see that all of the connections are tight in the second place, and

then examine the gage and pump to see if they are at fault. We are inclined to believe that the trouble is more apt to be of the nature mentioned than it is pump trouble. If you find that the pump is at fault you will probably find worn parts and the only way to remedy it in this event is to provide new parts or install a new pump.

ELECTRIC SYSTEM

STARTER TROUBLE

Q—Have had some trouble with an electric starter on a Ford. The battery had been charged and when it was replaced the ammeter did not show charge when the car was running but would show charge when the lamps were on. The battery was turned around and the ammeter showed 20 amperes discharge. The wires from the cutout on generator were removed and the ammeter went back to "O." When it was connected it would fall back to 20 amperes discharge. I knocked on the cutout a little and connected it up and it was O.K. except when it was charging at about 5 amperes the indicator would jump around on the ammeter, but it was steady at 10 amperes. What caused all this trouble?

2—Will the battery work the system any way it is put on?

3—When a battery is incorrectly connected will it show charge when it should be discharge?

4—What is wrong with a battery that tests only 1100 with the hydrometer but still turns the engine over nicely? This hydrometer is accurate as it has been tested.

5—Do the cutout points have to be a certain distance apart? How many thousandths of an inch?

6—When going up a hill with a Grant 6 it popped a few times and stopped. The engine was again started and the car ran without any more trouble. What was the trouble?

7—What is wrong with the Ford equipped with an Atwater Kent system when the front cylinder does not fire? It does not get strong enough spark and is irregular. Installed a new wire leading to that plug. The segment seemed to be making good contact.

8—How far apart should the points on this system be? They are about .020 or

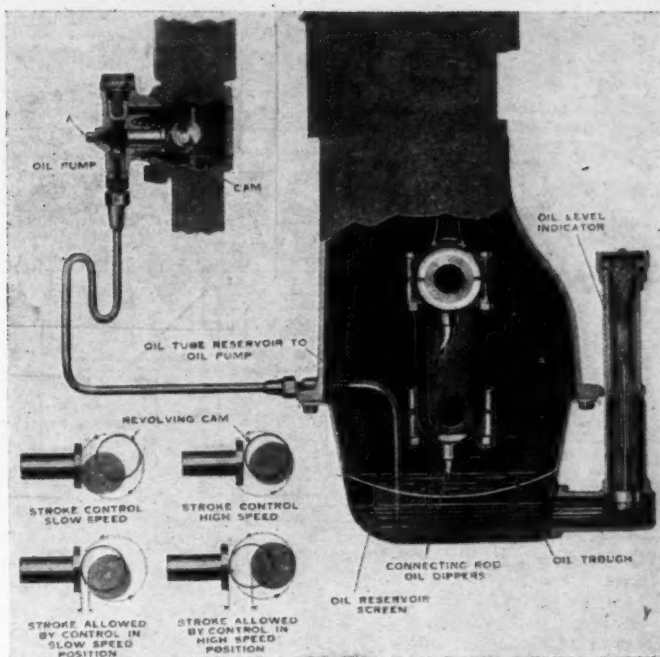


Fig. 4—View of the oil pump on the 1919 Essex

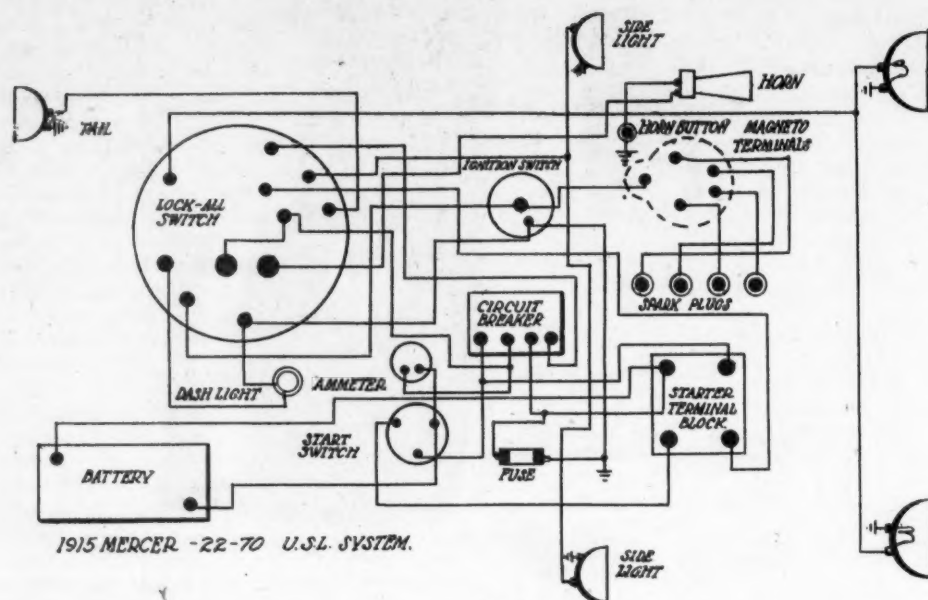


Fig. 5

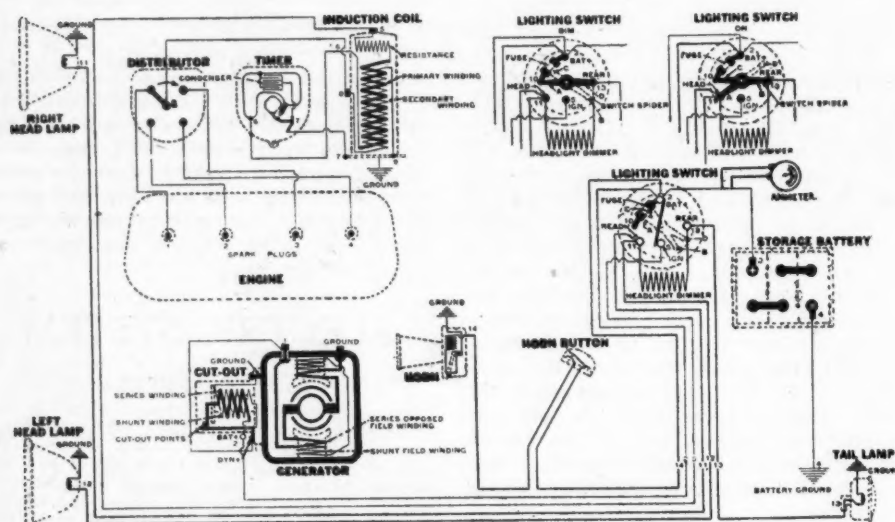


Fig. 6—Roller Smith ammeter installation on the 1920 Maxwell truck

.030 in. apart but the engine cannot be started if they are closer.

9—What is the distance between the push rod and valve stem on a Ford?

10—What is the distance between coil spool and magnets on the flywheel?—Clifton B. Norris, Willow Shade, Ky.

1—In answering this question we will have to use our imagination to some extent as you do not even mention what kind of a starting system is used. We will base our answer on the F. A. system that is now used on the Ford car. To locate the trouble in a case like this, first get an extra length of insulated wire with ends barred, not smaller than No. 12 in size. Connect one end of the wire to the terminal on top of the generator. Remove the wire from cutout before connecting the extra wire. Connect the other end of the extra wire to the terminal post of the ammeter, to which you already connected the wire which you have removed from the positive post of the battery when you first connected in your ammeter. See Fig. 7. Now look at your ammeter. If the pointer is still over the zero line, indicating that there is no charging current flowing, or if the pointer goes backward,

indicating that the battery is discharging into the generator, the generator is not working properly and tests of the generator will have to be made. If the pointer on the ammeter indicates that the generator is charging about 10 amperes, there is a break in the circuit between the generator and battery. Disconnect the extra wire from the terminal on your ammeter. The other end should

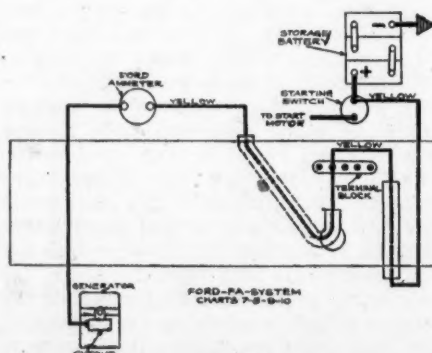


Fig. 7—Ammeter installation on the Ford F. A. system

still be connected to the terminal on the generator. With the end of the extra wire, which you removed from the terminal of the ammeter, touch B terminal on the cutout. If the pointer indicates charge, touch this wire to the terminal on the ammeter to which two wires are connected. If the pointer indicates that generator is charging battery there is a break in the wire leading from the ammeter to the cutout. Make a careful examination of all of the wires to see that they are in good condition and that the connections are tight. From the description given it is impossible for us to tell what you have done and therefore cannot give any positive remedy. The battery should be connected in only one manner and in your case we believe the battery negative should be grounded. If you reversed the battery connections you naturally reversed the polarity. The only suggestion we can give is that you follow out the test methods given to determine what part of the circuit is giving the trouble and then testing that particular part.

2—The battery is meant to be connected in only one way and naturally if connected wrong the polarity will be reversed.

3—In case the battery was connected wrong, if the generator polarity did not change immediately, then the battery would be discharging because the cutout points would open and close causing sparking and also vibration of the ammeter, until the points become so pitted that they will stick together.

4—As long as the battery is operating successfully we cannot see that there is anything wrong with it. Low gravity naturally indicates that the acid is low, but if so, it only indicates that the life of the battery ought to be longer, and our advice is to leave the electrolyte as it is as long as the battery is working alright.

5—The correct distance between the cutout points used on the F. A. system is 1/32 in.

6—This is rather an indefinite statement and as long as it occurred but once we see no reason for worry. Probably it was caused by a little dirt in the gasoline that plugged up the flow for just an instant and was soon dislodged.

7—A weak spark may indicate a weak battery. Make a test of the battery and if it is found up to charge and in good condition, examine first the primary wiring. Examine and if necessary adjust the contact points. If this fails to reveal the difficulty, go carefully over the secondary wiring from distributor to plugs. Look for loose connections or broken wires. Remember that a thorough test of all of the spark plugs should be made to see that they are in good condition and that the gap between the electrodes is correct.

8—The normal gap should be between .005 and .008 in. The standard factory setting is .006 in. If you cannot start the engine if the gap is set normal you must have some other difficulty besides ignition trouble.

9—The clearance between the push rod and valve stem should never be greater than 1/32 in. or less than 1/64 in. The

correct clearance is naturally half way between these two measurements. The gap should be measured when the push rod is on the heel of the cam. If the clearance is greater, the valve will open late and close early, resulting in uneven running. If the clearance is less than 1/64 there is danger of the valve remaining partially open all the time.

10—There are 16 coils used in this armature but we cannot state just what the distance is between them as we have no detailed dimensioned drawings.

MAXWELL AMMETER INSTALLATION

Q—The battery on a 1920 Maxwell 1½ ton truck had to be charged twice during its three months operation. The generator runs from the fan belt. Desire to install an ammeter so as to be able to tell whether the generator is charging or not. Instruct how to connect it up.

2—Instruct how to connect a Remy generator from a 1915 Empire to a special big six 1916 Mitchell. There is a large gear directly below the front seat where the starting motor is meshed.—John Liken, Woodward, Okla.

1—Shown in Fig. 6. Use Roller Smith ammeter, universal model.

2—You will have to make the installation so that the Remy generator will run the same as the generator now used in this model. This generator ought to run at crankshaft speed and the only suggestion we can make is that you provide some means of driving the generator at this speed either by gear or chain drive. Since we have no detail drawings of the Mitchell chassis layout, it is impossible for us to make any exact statements as to just how the connection should be made. When a change of this kind is made, the success of the installation is almost entirely dependent upon the ingenuity of the man who is doing the job. According to information we have in our files, the system used on this car was a single unit system motor-generator and we believe that it will be possible to connect the Remy generator in the same place.

MERCER WIRING DIAGRAM

Q—Publish wiring diagram of the 1915 Mercer Series 22-70.—M. J. Frankovich, Utility Electric Co., Indiana, Pa.

The U.S.L. system used on the 1915 Mercer 22-70 is shown in Fig. 5.

GENERATOR FOR GARAGE LIGHTING

Q—Have a Gray and Davis motor generator type M. G. 9, taken from a 1916 Ford car which I desire to use for lighting my shop. It generates 6 volts, 8 amp. at 1575 r.p.m. How many 15 c.p. lamps would it operate at one time running at about 1800 r.p.m. Publish diagram of such a lighting system, using a storage battery in connection with it so that I could crank my 3 h.p. gas engine with the generator.

2—What gauge single strand copper wire should be used on such a system, using parallel wiring, the farthest light being about 60 ft. from the generator or battery?—Marion W. Smith, Derby, Kans.

1 and 2—Although it is possible to furnish light for the garage it will require the service of at least fifteen batteries. This would mean that the generator would have to run at its full charging rate for practically fifteen hours out of the twenty-four and we cannot see how this could be a feasible plan. Unless you had a larger generator, the plan is very

impractical and the only thing to do is to install a farm lighting system for lighting and power purposes.

GENERATOR FAILS TO CHARGE

Q—The Delco generator on a 1916 Oldsmobile will not build up. Adjusting the third brush makes no change in output. After sanding in brushes it will put out 15 amperes for half a minute but then it will drop down to not over one or two amperes. Installing and fitting new brushes gave the same results. Commutator is in good shape. Have not tested field or armature. Where is the trouble most likely to be?—Q. A. Rowen, Antoine, Arkansas.

If the generator is not generating its full output, it may logically be attributed to one of the following causes: a ground in the circuit; brushes grounded with brush holder and frame with carbon dust; brushes worn or not seating; commutator dirty or out of round; high mica. We believe that in your case the trouble is either high mica or the brushes are grounded with the brush holder and frame. In case the trouble was due to loose commutator bar or connections it would probably show up in the form of sparking at the brushes. The fact that when the commutator is cleaned with sandpaper the charging rate is normal seems to indicate that the trouble is due to poor contact, which is very apt to be caused by high mica. If you find that the mica is high, place the armature in the lathe and turn it down to the desired finish. After this operation the mica can be undercut say about 1/64 in. with the use of a special tool using the lathe as a planer, the tool being moved with the lateral feed.

TIME AND SPEED CHART

Q—Some time ago you published a scale showing the different rates of speed car travels, as follows: Car traveling a mile a minute or one-half mile in thirty seconds, is known to travel 60 m.p.h. At what rate of speed is a car traveling when it goes one-half mile in 29, 28, 27 seconds, on down to 20 seconds?—Harry L. Atlass, Sr., Lincoln, Ill.

From Fig. 8 you can obtain the speed

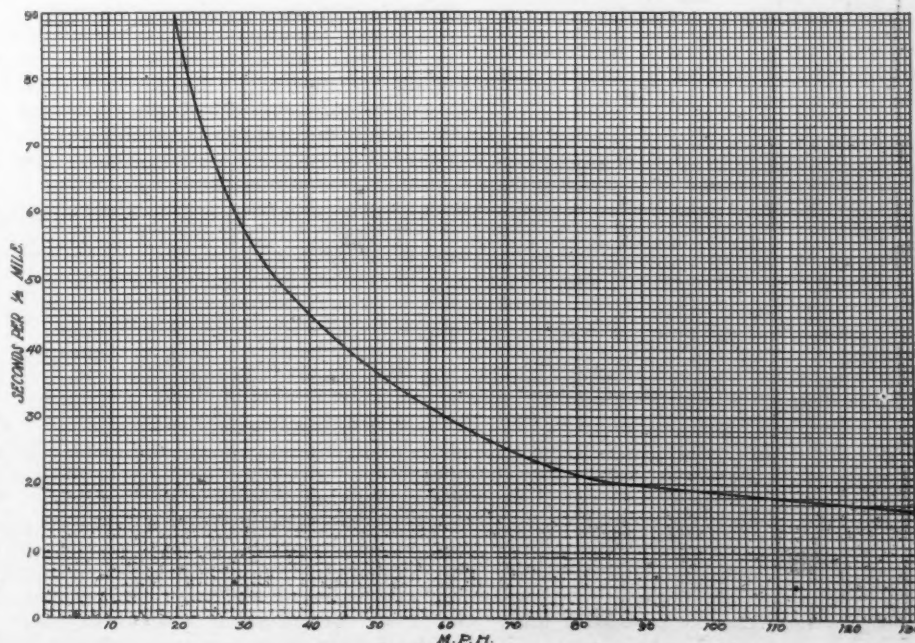


Fig. 8—Time and speed chart

in m.p.h. corresponding to the number of seconds required to travel one-half mile. The figures used in plotting the curve are obtained from the formula miles per hour distance $\times 3600$

seconds

RELINING DODGE CLUTCH

Q—What is the gear ratio of the 1916 Dodge?

2—Instruct how to line the disk clutch.

3—What causes the clutch to grind when running in intermediate gear?—George Kraus, Mogollon, N. M.

1—The gear ratio is 3.61 to 1.

2—In order to line the clutch disks it will be necessary to remove and entirely disassemble the clutch. This is quite a complicated job and will require considerable time if you are not familiar with the job. In the first place disconnect the universal joint. Disconnect the exhaust pipe and remove the battery and battery box. Remove all of the belts that hold the clutch housing and also remove the bolts in the two rear legs of the engine. The clutch can then be removed by sliding it straight back and then dropping it. In order to permit the disks to be removed it will be necessary to compress the clutch spring and remove the collar which holds it. This can be accomplished by using a piece of pipe about 1½ in. in diameter and cutting two slots in it which can be used in engaging the split washer. Leverage can be gotten by the use of a 2 by 4. To reline the disks you will have to remove the old lining which is riveted to the plates, cut the new lining to the desired size and rivet it to the plates. In assembling the clutch the operation given will just be reversed.

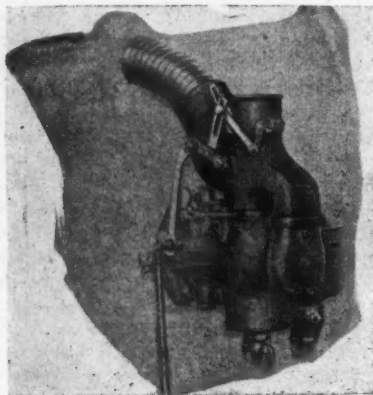
3—In the first place are you sure that it is the clutch that is at fault. We are inclined to believe that the trouble is in the countershaft of the transmission rather than the clutch. This may be due to worn gears or worn bearings which are throwing the gears out of line.

The Accessory Show Case

New Fitments for the Car

Hexmen Temperstat

The Temperstat is a device to be attached to the carburetor air intake and it is claimed assists the evaporation and eliminates condensation of the mixture. The butterfly valve is operated through a connection of the throttle valve of the carburetor. A stove, attached to the exhaust pipe, is provided for preheating the air. By means of an adjustment on the dash, this instrument may be kept to approximately weather temperature.



Hexmen temperstat

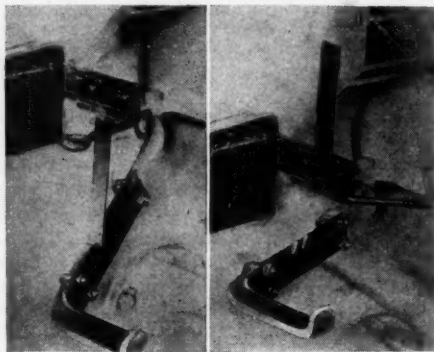
At any intermediate speed the air is tempered but when the throttle is wide open the cold air is admitted direct. The Temperstat is manufactured by Hexmen Motor Co., and lists at \$18. Racine, Wis.

Safety Clutch Release for Fordson Tractors

A serviceable appliance for Fordson tractors in the form of a safety clutch release is shown herewith. It is a simple



Burgess rebound shock absorber



Safety clutch release for Fordson tractors

appliance of all steel, capable of being applied in about fifteen minutes and supplies the release feature to the clutch which is otherwise engaged at all times.

Releasing the clutch idles the pulley and repairs or adjustments can be made on machines driven by the tractor with safety and eliminates the necessity of an extra man to hold in the clutch pedal. With the clutch disengaged, cranking becomes easier; otherwise it is necessary to turn over, not only the engine, but the heavy gears which run in thick oil.

Stopping in the field without shifting gears or stopping the engine is also made possible. The safety clutch release is made by the Mor-Air Auto Pump Co. of Naperville, Ill.

Parker Shock Absorber

The shock absorber, illustrated herewith, is composed of a chain, one end of which is permanently attached to the car axle, when installed, and the other end to a drum. When the absorber is in action, the motion is transmitted through a pair of eccentrics which are connected by a chain to a coil spring which is connected to one of the eccentrics. The working mechanism is entirely enclosed and works in oil. When the shock absorbers are installed, they are entirely out of sight. They are listed at \$60 per set by the Parker Shock Absorber Co., 221 S. Hoyne Ave., Chicago.

Red Devil Chisel and Punch Set

The Red Devil tool set, shown herewith, is a useful kit for motorists or machinists. In almost any kind of repair work, these tools will be in constant demand. For example, removing valves and piston rings in cylinders, cotterpins in crankshafts, relining brakes, replacing and repairing fan belts. Every tool is made of octagon stock, Swedish analysis point 80 carbon steel. They are 5 in. long and come in a neat khaki case

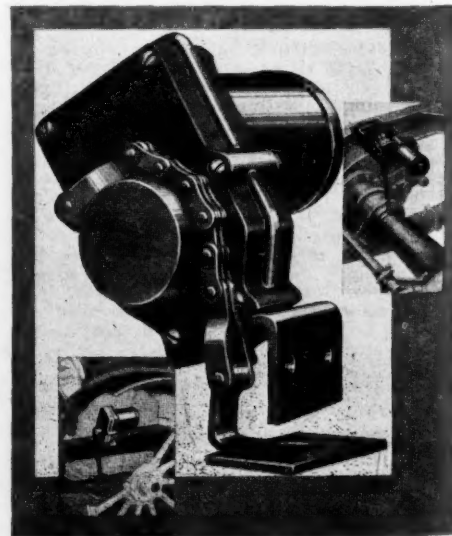
that can be rolled up and put in the coat pocket or in the side door of a car. The set consists of two cold chisels, two cape chisels, two machinists' pin punches, two solid punches, one half-round chisel, one round nose chisel, one diamond point chisel and one center punch. The tool kit is manufactured by the Smith & Hemenway Co., Irvington, N. J.



Red Devil chisel and punch set

Burgess Rebound Shock Absorber

The Burgess shock absorber, shown herewith, is designed for the Ford one-ton truck. The manufacturers, The Walter S. Burgess Mfg. Co., St. Joseph, Mich., claim that tests with this equipment have shown a saving of about one-third on gasoline, one-half on repairs and more than ten per cent increase in mileage. It is sturdily built, with two shock receiving springs on each rear unit.



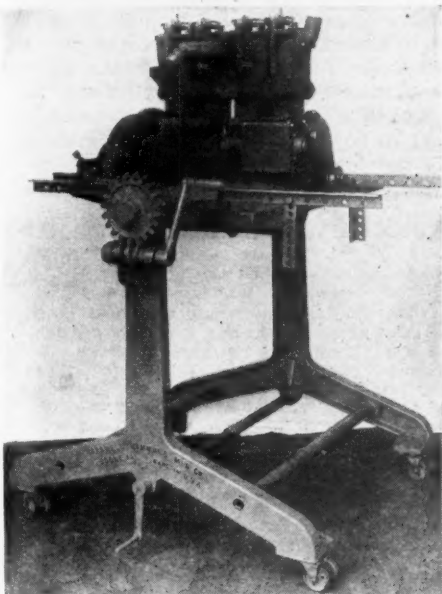
Parker shock absorber

Service Equipment

Time Savers for the Shop

Carswell-Hammond Universal Engine Stand

The engine stand shown in the illustration is adjustable for any make or size of engine. The crank at the bottom will adjust the stand instantly without loosening or fastening of any bolts or clamps. It is claimed that the worm and pinion adjustment which is the novel

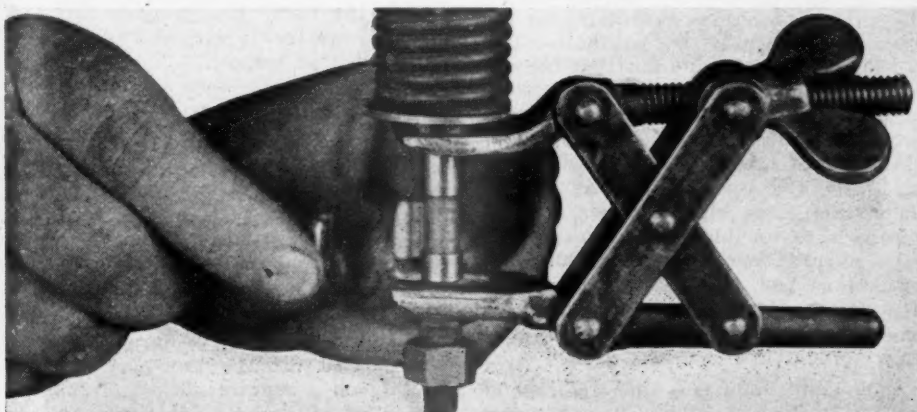


Carswell-Hammond engine stand

feature is not to be found on any other make of engine stand. Full details can be obtained from the Carswell-Hammond Mfg. Co., Boone, Ia.

Champion Boring Tool

The Champion boring tool for Ford and Fordson cylinders, shown herewith, consists of a top and bottom locating plate and a boring bar. There are two



Free-hand valve remover

locating plugs for the purpose of locating the top plate, after which it is bolted down to the top of the cylinder block by means of three cylinder head bolts and the locating plugs removed. The means of locating the bottom plate insures positive alignment with crankshaft bearings, and the plate is secured with two standard main bearing bolts.

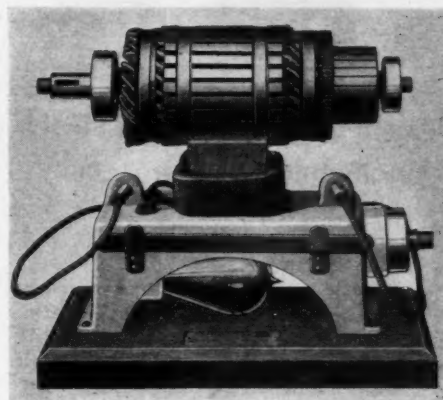
At a recent test of this machine conducted by the company, fifty cylinder blocks were rebored. Forty of these blocks were bored at a speed of 85 r.p.m. and .039 in. feed per minute which completed the boring of each cylinder in less than two minutes, ten seconds. Various speeds and tests were used on the last ten cylinder blocks; the last block was bored at a speed of 65 r.p.m. and .023 in. feed and produced, practically, a polished surface. This tool is manufactured by the Champion Mfg. Co., 2908 Fletcher Street, Philadelphia.

F-B 8 Armature Tester

The F-B 8 Armature Tester, illustrated herewith, is a device for instantly locating circuits and grounds in either the motor or generator armatures used on any make of starting and lighting system.

This instrument is similar in construction to the F-B 3 Ford Armature Tester and consists of an aluminum stand with a wood base, equipped with the necessary electrical apparatus for locating these troubles, and is designed to test an armature without the necessity of removing the bearings. Clips are furnished for holding the steel "feeler" so that it cannot be lost, and it is always in position for ready use.

Ten feet of Duplex motor cable, fitted with standard plug for insertion in 110 volt alternating current circuit, is part of the equipment. A switch mounted on the instrument gives instant control of



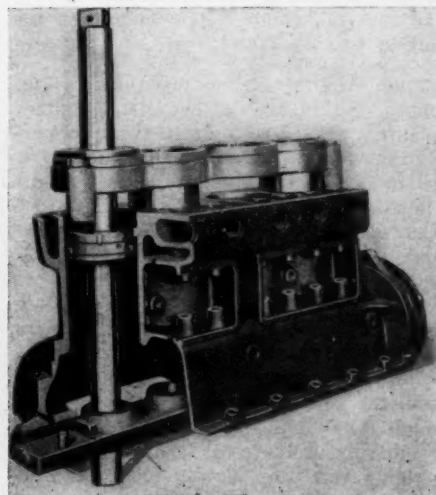
F. B. 8 armature tester

the device without the necessity of detaching the cable for each set.

The Fairbanks Co., 416 Broome St., New York, furnishes an illustrated instruction booklet with each instrument clearly stating the operation of the tester and method of locating grounds, shorts and opens in armatures. They list the tester at \$45.

Free-Hand Valve Remover

The valve remover, shown in position in the illustration, is a handy tool for the service mechanics' kit. It is of simple construction and the movement necessary for the compression of the spring is accomplished by turning a wing nut. This tool is small and can be used in tight places leaving both hands free to do the work necessary in removing the valve. The Free-Hand valve remover is manufactured by the Valve Remover Sales Co., 1205 Oak Street, Kansas City.



Champion boring tool

Law in Your Business

By Wellington Gustin



Dealers' Agency Of a Line Of Automobiles Not An Agency In Law

A DISPUTED question of agency for the sale of a line of automobiles is involved in the recent decision of the Supreme Court of Vermont, wherein the purchaser of an automobile sued both the dealer and the manufacturer for breach of the warranty as to the car. It appears that a sand hole, due to defective casting, appeared in the cylinder block and a new one had to be procured and installed in the car. The dealer having died, the action was prosecuted against the manufacturer, and judgment was awarded the car owner. Upon appeal, the Supreme Court has reversed this judgment.

The manufacturer had no direct connection with the sale of the automobile, and before the customer could recover he was required to show that the dealer was the manufacturers' agent, clothed with authority to make the warranty relied upon. To show this relation the customer called the traveling salesman for the manufacturer who testified that the dealer was the company's general agent in Brattleboro, Vt. He explained this statement by saying that the dealer bought a certain number of cars of the manufacturer on a shipment on a bill of lading with a draft attached, paid the draft before the cars were unloaded, and took his cars and sold them. This explanation showed the real relation between the dealer and the manufacturer was that of vendor and vendee, and not that of principal and agent.

The term "agent" is used in various senses, but in law it has a well-defined meaning. It is frequently used in connection with an arrangement which does not in law amount to an agency, at all, where the essence of the arrangement is a bailment or a sale, for instance. Such use of the term is not unusual in cases where one has the exclusive right to sell a specified article in certain territory, though no agency in fact exists, said the court. Whether an agency does in fact exist in a given case depends upon the contract or arrangement under which the business is conducted, and it is entirely immaterial that the parties denominate the arrangement as an "agency." If one buys goods of another to sell on his own account, it is a pur-

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. *MOTOR AGE* presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty problems as may be submitted to him.

chase and not an agency, though called so by the parties.

Therefore, the court held that the traveling salesman was not attempting to speak as a lawyer when he said that the dealer was the manufacturers' agent, and that his explanation showed that he only meant that the dealer had the exclusive right to buy of the manufacturer and sell for himself this car in the Brattleboro territory. Judgment was, therefore, reversed in favor of the manufacturer.

The Garage Owner Must Exercise Reasonable Precaution

Q—What responsibility does a garage owner assume on cars accepted for storage in case of fire or theft under the Michigan law?—Pinkham & Wright, Hillsdale, Mich.

I find no exceptions in the Michigan law to the common law of liability of the garage owner on cars accepted for storage in case of fire or theft. The Michigan statute points out that he will be held responsible only for "reasonable care and vigilance" in protecting and preserving cars in case of fire. Courts have defined this reasonable care to be the care of a reasonably prudent man under the same circumstances, or the care of a reasonable prudent garageman in protecting and preserving his own property. You see the highest degree of care is not required, much less is one an insurer of the safety of the property stored.

This applies to a case where storage of the car is had for hire. But if a car, say, is left in storage over night without



compensation, charged or contemplated, then the garage owner is liable only for an exercise of slight care, and is liable only in case of gross neglect or bad faith. These same principles apply in case of loss by theft.

In case of loss by fire, the burden is on the owner of the automobile destroyed or damaged. In all these cases, fire or theft, the liability of the garage owner is predicated upon his negligence, and negligence is ordinarily a question of fact to be determined from the evidence by the jury.

Check Returned Marked "No Funds"

Please advise us as to the best course to take after a man has given us his check on a bank and the bank returns the check marked "No Funds". We have already written this man but he has not answered. Is there a Federal Bank that makes it their business to collect such checks?—Denoyer & Leach, Papineau, Ill.

There is no Federal Bank making it a business to collect returned checks. Collection of such is first the business of the one who stands to lose by the return.

Would advise that you find out why this check was not paid. It may be that the party gave you the check knowing he had no funds in the bank to meet it when presented for payment, and with no intention of depositing such amount to cover, thereby obtaining your property under false pretense. If such be the case then it is one for the state's attorney. Of course, it may be hard to prove a criminal intent to defraud, but the party may be willing to pay the check rather than have you attempt it.

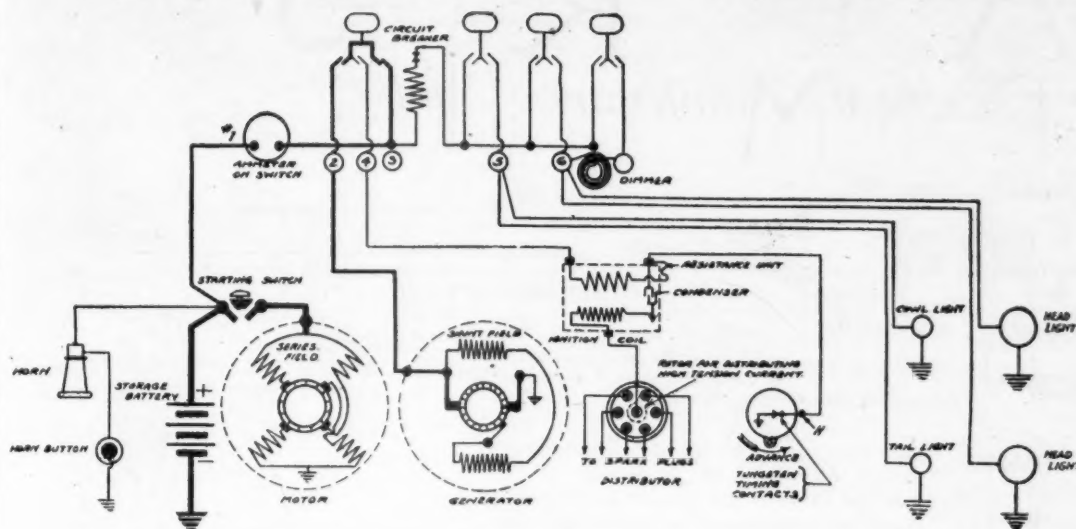
If it be an honest default on the check you should be able to collect at least by suit if the party has property. If the debt be one for repairs it may be you have a lien on his car.

SOUTH GOOD FIELD FOR TRUCKS

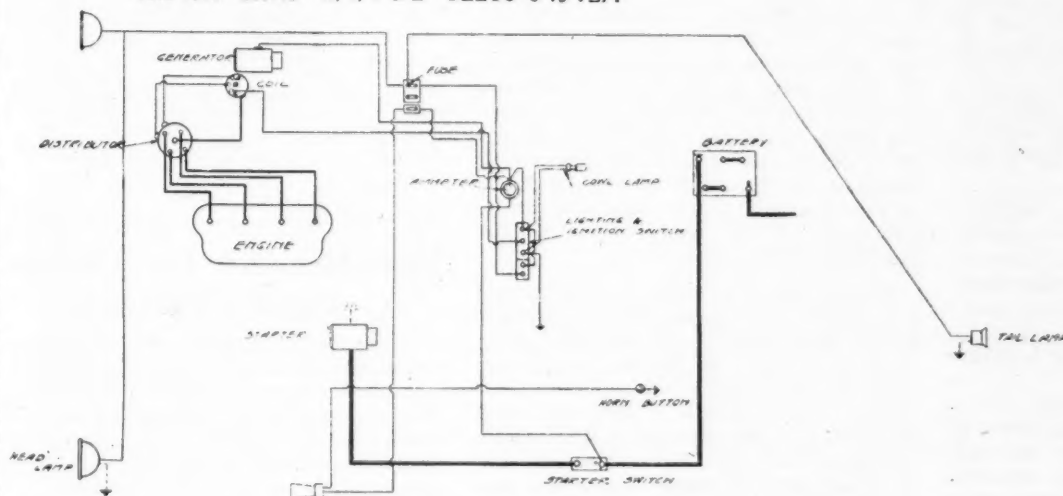
New Orleans, La., Aug. 2—The South, lacking in railroad facilities, must look to the motor truck to get its agricultural products to market, and the South today offers the most fertile field in the United States to the motor truck salesman.

These are the conclusions of C. F. Doty, general sales manager of the Sanford Motor Truck Co., of Syracuse, N. Y., who passed through New Orleans late in July on a tour of close and detailed inspection of the heavy duty motor truck business in the southern states.

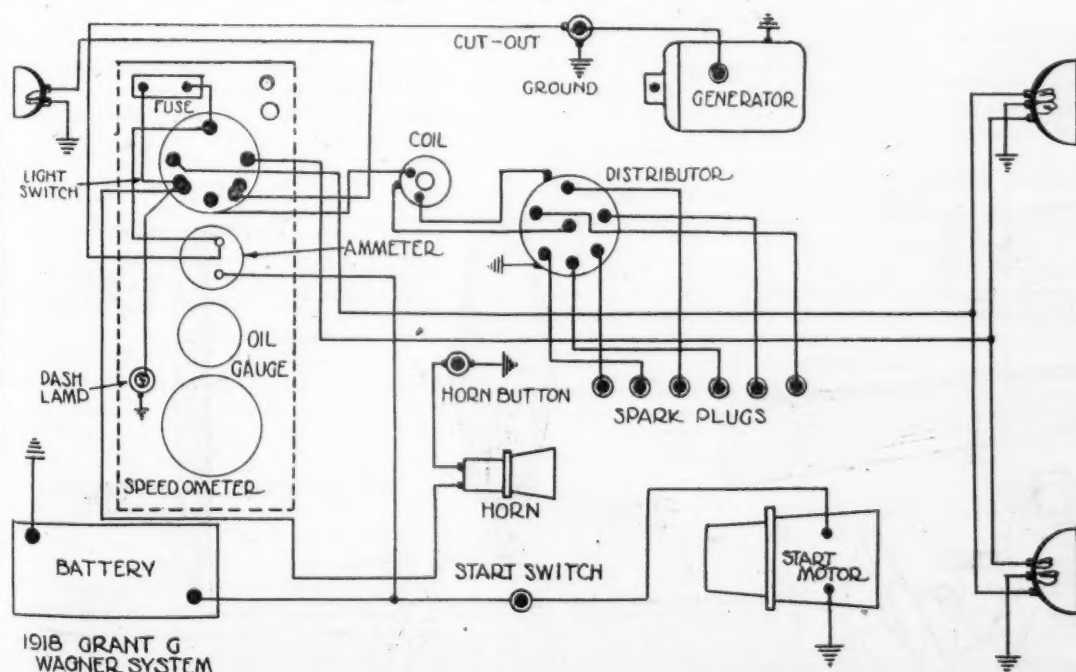
Motor Age Weekly Wiring Chart No. 90



1918-1919 DAVIS H. I. P. & L. DELCO SYSTEM



1918 Dort Westinghouse system



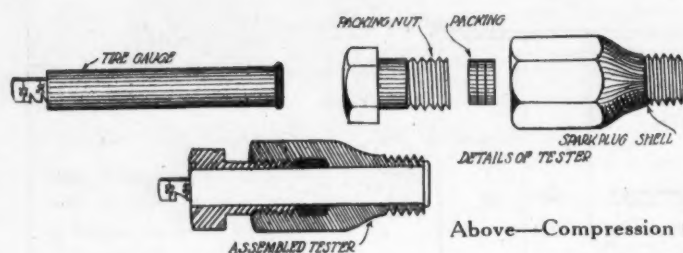
1918 GRANT G WAGNER SYSTEM

Name of car and date on which wiring diagrams have appeared in previous issues

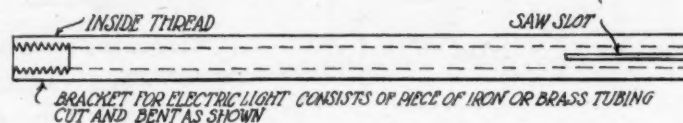
- Allen—June 17, '20
- Apperson—Aug. 5, '20
- Briscoe—May 6, '20
- Buick—July 15, '20
- Case—Aug. 5, '20
- Chalmers—June 17, '20
- Chandler—May 20, '20
- Cole—June 10, '20
- Crow-Elkhart—July 29, '20
- Dodge—July 1, '20
- Elear—May 6, '20
- Franklin—June 3, '20
- General Battery Charging—Sept. 15, '19
- General Magneto Diagram—June 15, '19
- Harroun—July 15, '20
- Haynes—June 24, '20
- Hupmobile—May 27, '20
- Internal Connections—July 10-17-24, '19
- Jeffery—May 13, '20
- Jordan—June 10, '20—July 22, '20
- King—May 20, '20
- Kissel—May 27, '20
- Lexington—July 29, '20
- Locomobile—June 6, '20
- Moline-Knight—May 20, '20—July 22, '20
- Moon—July 8, '20—July 29, '20
- Peerless—May 13, '20
- Pierce-Arrow—July 15, '20
- Reo—July 22, '20
- Roamer—Aug. 5, '20
- Studebaker—July 1, '20
- Stutz—July 8, '20
- Special Systems for Fords—May 15-22, '19

The Automotive Repair Shop

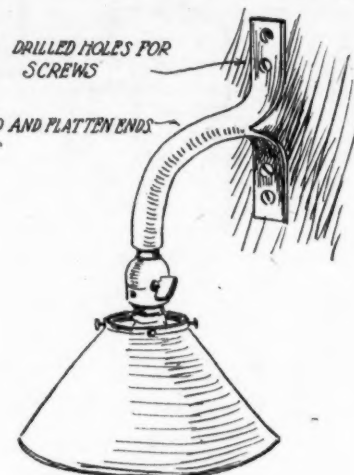
Practical Maintenance Hints



Above—Compression tester



Right—Bracket for light fixture



Pipe Bracket for Electric Light Fixture

A substantial bracket for supporting an electric light socket and shade can be made inexpensively from a section of iron or brass tube cut and bent as indicated in the sketch. One end of the pipe is bent and threaded for the light socket. The opposite end is split with a saw and flared, and drilled holes for screwing into the wall or support are made.

Wherever it is desired to mount a light on the desk, in a closet stairway or in the stockroom, this means avoids the expense of a fixture and makes a workmanlike job.

Improvised Screwdrivers

The first is a small tool commonly needed for tightening lamp sockets and small screws in the electrical system. This is made from the central electrode of a broken spark plug. Simply cut off the screw terminal and file the point to a blade.

The second is made from a worn out valve. The head is filed with notches to secure a grip and the point made into a blade by grinding.

For screws in cramped quarters where the length of the usual handle prevents its use, this tool will be found serviceable. The point can be hardened if it is to be used very much.

Testing for Cylinder Compression

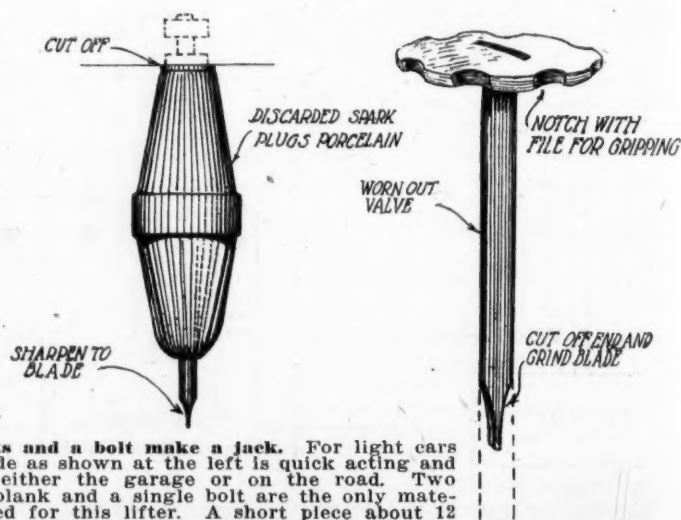
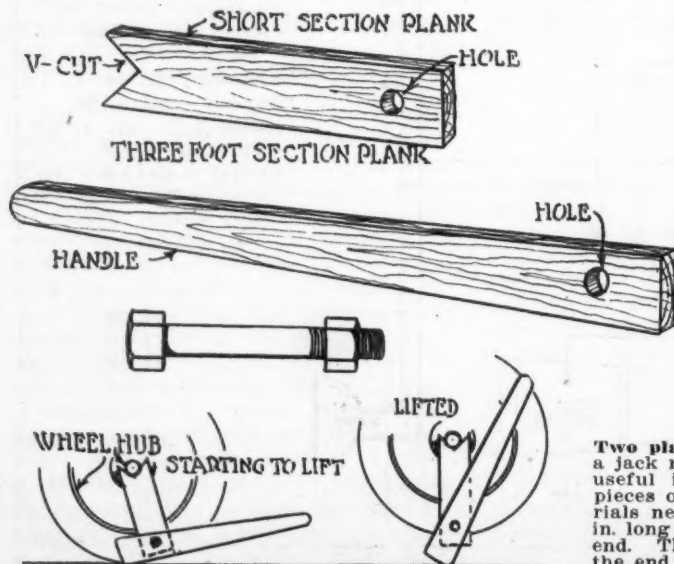
It is surprising what a difference of ten pounds in the compression between the cylinders in a multiple cylinder engine will make in the running of the car especially at low speeds and on the pickup.

In a test of a six-cylinder engine recently it was found that four cylinders registered seventy pounds each, while one cylinder gave sixty and another sixty-five pounds. The loss of compression

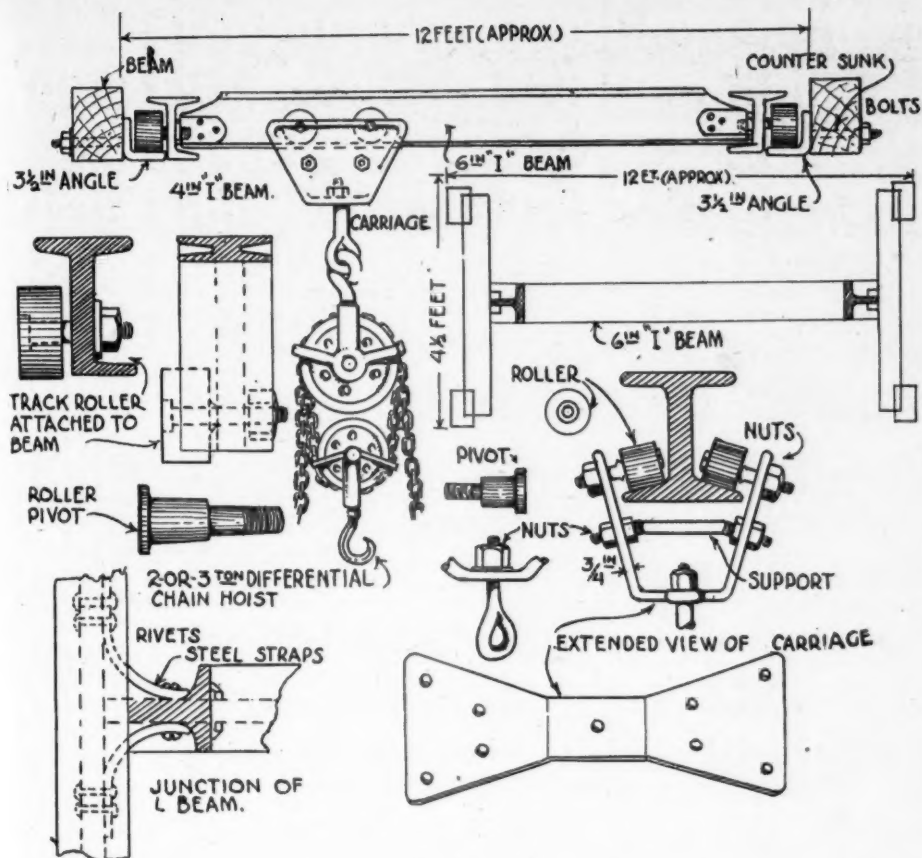
was overcome by backing the valve tappet adjusters off inasmuch as this was the cause of the loss in compression, these were holding the valves off their seats.

Incorrect valve adjustment, leaky gaskets, carbonized rings, loose petcocks and valve gages are some of the causes of slight leaks in the compression that are not so noticeable through the starting crank, yet these contribute to variations in the power impulses that cause imperfect action when accelerating and at slow speeds. A test with a compression gage is the best method of determining these imperfections.

In the sketch a tester is shown that was used to detect the above mentioned fault. Practically any one who possesses a tire gage of the type which sets itself to the registered pressure can assemble this in a spark plug shell and test out the compression of his engine cylinders similarly. The separating type of spark plug is used, the inside size of the shell must be large enough to admit the tire gage, otherwise it is necessary to drill it out to this size. Place several strands of hemp or flax packing around the gage and screw the packing nut down tight. This tester is then screwed into the cylinder as the spark plug would be put in.



Two planks and a bolt make a jack. For light cars a jack made as shown at the left is quick acting and useful in either the garage or on the road. Two pieces of plank and a single bolt are the only materials needed for this lifter. A short piece about 12 in. long is cut out V shaped and bored at the opposite end. The handle section is bored about 8 in. from the end and is about 3 ft. long.



Traveling Crane of Simple Construction Made in the Shop

A traveling crane which consists chiefly of a two or three ton chain hoist and structural steel is a labor and time saving addition to the garage or repair-shop that can be fitted up by the average mechanic at a small cost.

The details of a crane with a working width of twelve feet extending the length of the shop is shown in the illustration.

Two three and one-half inch angles are secured on parallel beams twelve feet apart for the entire length of the shop. The cross member is a six-inch "I" beam twelve feet long secured to two four-inch "I" beams four and a half feet long. Four wide face iron or steel wheels about five inches in diameter are attached to the ends of the short beams. A traversing carriage for the hoist is made as indicated in the sketch.

One of the advantages of the crane apart from saving in time is a much more orderly shop is maintained where the hoist is brought to the job, rather than bringing the job to the hoist and the resulting confusion is eliminated.

Paint and Carbon Remover

Benzol and alcohol is very effective in the removal of paint or cleaning carbon deposits from the engine.

To remove paint, put the mixture on with a brush and allow to remain for at least a half of an hour. This softens the paint and it can then be removed or

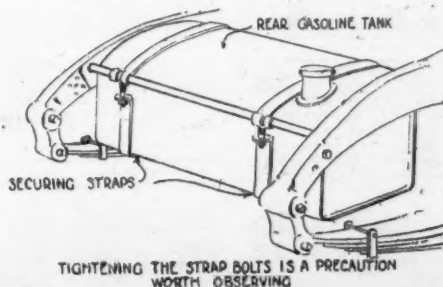
rubbed off with pieces of burlap.

To clean out carbon, pour about an ounce in each cylinder, or, better yet, squirt it in with an oil gun. Leave this mixture in the cylinder overnight or for about six hours. The softened carbon will be blown out through the exhaust when the engine is started.

Tighten the Gasoline Tank Straps Occasionally

The tightening of the straps holding the gasoline tank may appear as a minor suggestion, however, neglect of this detail may result in a more or less embarrassing situation if you find the tank has dropped off some five or six miles behind and the engine has continued to run on the vacuum tank for this distance. On a recent holiday a New York motorist was observed in this predicament fifteen miles from Atlantic City. About five miles behind him some other motorists were seen amusedly examining a half-filled gasoline tank in the middle of the road.

The owner may have recovered his tank, however, it is obvious that he spent some anxious time on a hot and dusty road in his search.



Avoid Oil Leaks by Use of Proper Gaskets

Many car owners judge the quality of a repair shop's work by the amount of oil and grease that leaks out of the engine, transmission and axle, after their car has been repaired.

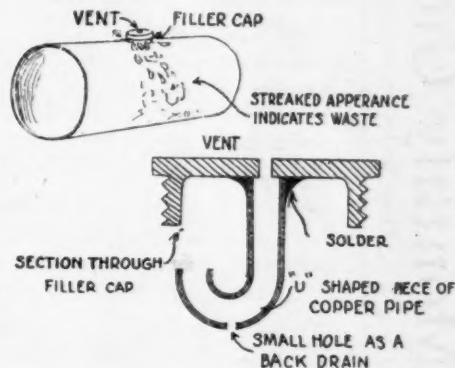
Many car owners are observing, and learn quite early, that a glance under the car to discern gasoline, grease, oil or water leaks is an inspection service which locates possible trouble which should be corrected, naturally he looks upon a leaky gasket with suspicion.

Invariably mechanics make the mistake of putting in felt gaskets by literally soaking it with shellac. A felt gasket, so treated, becomes hard or brittle and has practically no oil retaining properties. A felt gasket should only be treated with some hard grease or graphite grease and it will retain its resiliency when put in place.

Shellac should only be used on thin paper gaskets to be bolted solidly between two machined surfaces and then it is doubtful if the shellac is of much use. Where no gaskets are used between parts, a coating of shellac is an advantage, as it fills the crevice which would permit of leaks.

One of the best gasket materials which is now commonly used is the ground cork composition gasket.

Cork possesses and retains, even after a long period of use, the necessary resiliency to remain expanded in the joint, keeping oil and grease where it should remain. A cork gasket can and should be put in without any shellac.



Preventing Waste at the Gasoline Tank Cap

Waste of gasoline at the prevailing prices is more or less expensive. The vent in the tank filling cap of the automobile is necessary for the proper feeding of gas to the carburetor, however, considerable gasoline splashes out of this opening air as is evidenced by the streaked appearance of the tank.

The illustration is of a simple attachment that will stop the splashing of the oil, without interfering with the vent.

A U shape of copper pipe is soldered to the inside of the cap.

This has a small drain hole through the bottom. The oil that splashes into the pipe drains back into the tank, stopping this loss.

Motor Age Monthly Guide to Truck Specifications

These tables are revised and brought up to date monthly

Name and Model	Chassis Price	Front Tire	Rear Tire	Name of Engine	No. Cyl. Bore	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
A & B 3T	4853	4853	4853	Own	4-5 17x4	Bosch	none	none	Scheb	none	Own	in-g	Own	Gen
A & B 5T	4853	4853	4853	Own	4-5 17x4	Bosch	none	none	Scheb	none	Own	in-g	Own	Gen
Acson R	2,400	36x6	36x6	Wauk.	4-5 17x4	Elec.	Wauk.	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ros
Acson RB	2,650	36x6	36x6	Wauk.	4-5 17x4	Elec.	Wauk.	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ros
Acson H	3,850	36x6	36x6	Wauk.	4-5 17x4	Elec.	Wauk.	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ros
Acson L	4,900	36x6	40x6	Wauk.	4-5 17x4	Elec.	Wauk.	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ros
Acson M	5,850	36x6	40x6	Wauk.	4-5 17x4	Elec.	Wauk.	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ros
Acson N	36x6	36x6	36x6	Wauk.	4-5 17x4	Elec.	Wauk.	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ros
Acson T	2,750	36x6	36x6	Buda	4-5 17x4	Elec.	West	Pierce	Scheb.	M&E	Cotta	worm	Timkn.	Ros
Acson U	3,450	36x6	36x6	Buda	4-5 17x4	Elec.	West	Pierce	Scheb.	M&E	Cotta	worm	Timkn.	Ros
Acson V	2,750	36x6	36x6	Buda	4-5 17x4	Elec.	G&D	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson W	2,375	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson X	3,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson Y	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson Z	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AA	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AB	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AC	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AD	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AE	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AF	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AG	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AH	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AI	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AJ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AK	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AL	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AM	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AN	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AO	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AP	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AQ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AR	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AS	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AT	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AU	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AV	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AW	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AX	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AY	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson AZ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BA	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BB	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BC	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BD	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BE	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BF	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BG	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BH	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BI	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BJ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BK	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BL	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BM	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BN	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BO	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BP	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BQ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BR	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BS	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BT	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BU	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BV	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BW	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BX	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BY	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson BZ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CA	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CB	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CC	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CD	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CE	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CF	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CG	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CH	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CI	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CJ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CK	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CL	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CM	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CN	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CO	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CP	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CQ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CR	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CS	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CT	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CU	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CV	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CW	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CX	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CY	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson CZ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DA	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DB	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DC	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DD	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DE	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DF	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DG	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DH	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DI	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DJ	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DK	4,050	36x6	36x6	Cont.	4-5 17x4	Elec.	Elec.	Duplx.	Ray.	B&B.	Cotta	worm	Timkn.	Ros
Acson DL	4,050	36x6	36x6	Cont.	4-5 17x4	E								

[illegible]

These tables are revised and brought up to date monthly

Name and Model	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore	Ignition	Governor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Keane, K-1	1,500 32x4	32x4	32x4	Light	4-31x4	Bell	Mon.	Zenith	G-L	in-g.	Torbn.	Lavn.
Keane, K-2	2,100 34x3	34x3	34x3	H-5	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-3	2,885 36x4	36x4	36x4	Buda	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-4	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-5	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-6	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-7	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-8	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-9	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-10	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-11	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-12	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-13	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-14	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-15	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-16	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-17	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-18	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-19	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-20	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-21	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-22	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-23	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-24	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-25	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-26	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-27	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-28	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-29	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-30	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-31	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-32	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-33	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-34	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-35	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-36	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-37	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-38	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-39	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-40	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-41	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-42	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-43	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-44	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-45	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-46	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-47	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-48	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-49	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-50	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-51	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-52	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-53	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-54	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-55	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-56	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-57	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-58	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-59	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-60	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-61	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-62	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-63	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-64	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-65	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-66	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-67	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-68	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-69	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-70	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-71	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-72	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-73	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-74	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-75	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-76	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-77	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-78	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-79	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-80	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-81	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-82	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-83	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-84	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-85	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-86	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-87	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-88	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-89	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-90	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-91	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-92	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-93	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-94	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-95	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-96	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-97	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-98	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-99	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-100	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-101	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-102	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-103	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-104	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-105	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-106	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-107	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-108	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-109	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-110	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-111	3,000 36x4	36x4	36x4	Own	4-31x4	Bell	Pierce	B-L	G-L	in-g.	Torbn.	Lavn.
Keane, K-112	3,000 36x4	36x4	36x4	Own	4-31x4							

Dimensions and Numbers of Standardized Ball Bearings

Motor Age Maintenance Data Sheet No. 109

One of a series of weekly pages of information
valuable to service men and dealers—save this page

Light Series

Bear- ing Num- ber	BORE				OUTSIDE DIAMETER				WIDTH		MINIMUM CORNER RADIUS		ECCENTRICITY TOLERANCE, IN.	
	Mm.	In.	Inch Tolerance		Mm.	In.	Inch Tolerance		Mm.	In. +0.0000 -0.0050	Mm.	In.	Inner Race	Outer Race
			Plus	Minus			Plus	Minus						
200	10	0.39370	0.0002	0.0004	30	1.18110	0	0.0005	9	0.35433	1	0.04	0.0006	0.0012
201	12	0.47244	0.0002	0.0004	32	1.25984	0	0.0005	10	0.39370	1	0.04	0.0006	0.0012
202	15	0.59055	0.0002	0.0004	35	1.37795	0	0.0005	11	0.43307	1	0.04	0.0006	0.0012
203	17	0.66929	0.0002	0.0004	40	1.57481	0	0.0005	12	0.47244	1	0.04	0.0006	0.0012
204	20	0.78740	0.0002	0.0004	47	1.85040	0	0.0005	14	0.55118	1	0.04	0.0006	0.0012
205	25	0.98425	0.0002	0.0004	52	2.04725	0	0.0008	15	0.59055	1	0.04	0.0008	0.0012
206	30	1.18110	0.0002	0.0004	62	2.44095	0	0.0008	16	0.62992	1	0.04	0.0008	0.0012
207	35	1.37795	0.0002	0.0004	72	2.83465	0	0.0008	17	0.66929	1	0.04	0.0008	0.0012
208	40	1.57481	0.0002	0.0004	80	3.14962	0	0.0008	18	0.70866	2	0.08	0.0008	0.0012
209	45	1.77166	0.0002	0.0004	85	3.34647	0	0.0008	19	0.74803	2	0.08	0.0010	0.0016
210	50	1.96851	0.0002	0.0004	90	3.54332	0	0.0008	20	0.78740	2	0.08	0.0010	0.0016
211	55	2.16536	0.0002	0.0004	100	3.93702	0	0.0008	21	0.82677	2	0.08	0.0010	0.0016
212	60	2.36221	0.0002	0.0005	110	4.33072	0	0.0008	22	0.86614	2	0.08	0.0010	0.0016
213	65	2.55906	0.0002	0.0005	120	4.72443	0	0.0008	23	0.90551	2	0.08	0.0010	0.0016
214	70	2.75591	0.0002	0.0005	125	4.92128	0	0.0008	24	0.94488	2	0.08	0.0010	0.0016
215	75	2.95277	0.0002	0.0005	130	5.11813	0	0.0008	25	0.98425	2	0.08	0.0010	0.0016
216	80	3.14962	0.0002	0.0005	140	5.51183	0	0.0008	26	1.02362	3	0.12	0.0012	0.0018
217	85	3.34647	0.0002	0.0006	150	5.90554	0	0.0012	28	1.10236	3	0.12	0.0012	0.0018
218	90	3.54332	0.0002	0.0006	160	6.29924	0	0.0012	30	1.18110	3	0.12	0.0012	0.0018
219	95	3.74017	0.0002	0.0006	170	6.69294	0	0.0012	32	1.25984	3	0.12	0.0012	0.0018
220	100	3.93702	0.0002	0.0006	180	7.08664	0	0.0012	34	1.33858	3	0.12	0.0012	0.0018
221	105	4.13387	0.0002	0.0006	190	7.48035	0	0.0012	35	1.41732	3	0.12	0.0012	0.0018
222	110	4.33072	0.0002	0.0006	200	7.87405	0	0.0012	38	1.49607	3	0.12	0.0012	0.0018

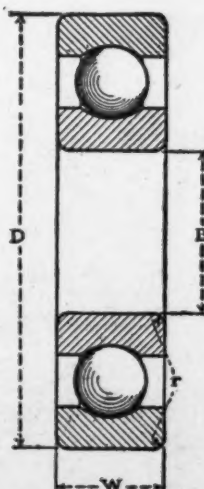
Medium Series

300	10	0.39370	0.0002	0.0004	35	1.37795	0	0.0005	11	0.43307	1	0.04	0.0006	0.0012
301	12	0.47244	0.0002	0.0004	37	1.45669	0	0.0005	12	0.47244	1	0.04	0.0006	0.0012
302	15	0.59055	0.0002	0.0004	42	1.65355	0	0.0005	13	0.51181	1	0.04	0.0006	0.0012
303	17	0.66929	0.0002	0.0004	47	1.85040	0	0.0005	14	0.55118	1	0.04	0.0006	0.0012
304	20	0.78740	0.0002	0.0004	52	2.04725	0	0.0008	15	0.59055	1	0.04	0.0006	0.0012
305	25	0.98425	0.0002	0.0004	62	2.44095	0	0.0008	17	0.66929	1	0.04	0.0008	0.0012
306	30	1.18110	0.0002	0.0004	72	2.83465	0	0.0008	19	0.74803	2	0.08	0.0008	0.0012
307	35	1.37795	0.0002	0.0004	80	3.14962	0	0.0008	21	0.82677	2	0.08	0.0008	0.0012
308	40	1.57481	0.0002	0.0004	90	3.54332	0	0.0008	23	0.90551	2	0.08	0.0008	0.0012
309	45	1.77166	0.0002	0.0004	100	3.93702	0	0.0008	25	0.98425	2	0.08	0.0010	0.0016
310	50	1.96851	0.0002	0.0004	110	4.33072	0	0.0008	27	1.06299	2	0.08	0.0010	0.0016
311	55	2.16536	0.0002	0.0004	120	4.72443	0	0.0008	29	1.14173	2	0.08	0.0010	0.0016
312	60	2.36221	0.0002	0.0005	130	5.11813	0	0.0008	31	1.22047	2	0.08	0.0010	0.0016
313	65	2.55906	0.0002	0.0005	140	5.51183	0	0.0008	33	1.29921	3	0.12	0.0010	0.0016
314	70	2.75591	0.0002	0.0005	150	5.90554	0	0.0012	35	1.37795	3	0.12	0.0010	0.0016
315	75	2.95277	0.0002	0.0005	160	6.29924	0	0.0012	37	1.45669	3	0.12	0.0010	0.0016
316	80	3.14962	0.0002	0.0005	170	6.69294	0	0.0012	39	1.53544	3	0.12	0.0012	0.0018
317	85	3.34647	0.0002	0.0006	180	7.08664	0	0.0012	41	1.61418	3	0.12	0.0012	0.0018
318	90	3.54332	0.0002	0.0006	190	7.48035	0	0.0012	43	1.69292	3	0.12	0.0012	0.0018
319	95	3.74017	0.0002	0.0006	200	7.87405	0	0.0012	45	1.77166	3	0.12	0.0012	0.0018
320	100	3.93702	0.0002	0.0006	215	8.46460	0	0.0012	47	1.85040	3	0.12	0.0012	0.0018
321	105	4.13387	0.0002	0.0006	225	8.85830	0	0.0012	49	1.92914	3	0.12	0.0012	0.0018
322	110	4.33072	0.0002	0.0006	240	9.44886	0	0.0012	50	1.96851	3	0.12	0.0012	0.0018

Light Series, Extra Large Annular Ball

No.	B		D		W OF INDIVIDUAL RING		r CORNER RADIUS MIN.	
	Mm.	In. +0.0002 -0.0006	Mm.	In. +0.0000 -0.0012	Mm.	In. +0.0000 -0.0030	Mm.	In.
224	120	4.7244	215	8.4646	42	1.6535	3	0.12
226	130	5.1181	230	9.0551	46	1.8110	3	0.12
228	140	5.5118	250	9.8425	50	1.9685	3	0.12
230	150	5.9055	270	10.6299	54	2.1280	4	0.16
232	160	6.2992	290	11.4173	58	2.2835	4	0.16
234	170	6.6929	310	12.2047	62	2.4409	4	0.16
236	180	7.0866	330	12.9921	66	2.5984	4	0.16
238	190	7.4803	350	13.7795	70	2.7559	4	0.16
240	200	7.8740	370	14.5669	74	2.9134	5	0.20
242	210	8.2677	390	15.3543	78	3.0709	5	0.20

Eccentricity tolerances: inner race, 0.0012 in.; outer race, 0.0018 in.



Definition of Eccentricity

S. A. E. Standard

The eccentricity of the inner race is that lack of running truth noticed upon the stationary outer race when rotating the inner race and balls upon true centers.

The eccentricity of the outer race is that lack of running truth shown upon a suitable indicator during the rotation of the outer race and balls upon the inner race fixed upon a stationary arbor.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

Des Moines, Ia.	Annual Fall Show	Aug. 25-Sept. 6
Toronto, Exhibition City	National Automobile Show	Aug. 28-Sept. 11
Milwaukee	Annual Fall Automobile Show	Aug. 30-Sept. 4
Sacramento, Cal.	Annual Show	Sept. 4-12
Indianapolis	Fall Automobile Show	Sept. 6-11
Cincinnati	Annual Passenger Car Show	Sept. 18-25
Buffalo	Closed Car Show	Sept. 27-Oct. 2
Northampton, Mass.	Annual Automobile Show	Oct. 6-8
Jersey City, N. J.	Annual Automobile Show	Nov. 1-6
New York	Automobile Salon	Nov. 14-21
Chicago	Automotive Equipment Show	Nov. 15-20
New York	National Passenger Car Show	Jan. 8-15, 1921
Chicago	National Passenger Car Show	Jan. 29-Feb. 4, 1921

TRACTOR SHOWS

Los Angeles, Cal.	National Tractor and Implement Show of the West	Sept. 20-26
Columbus, O.	National Tractor Show	Feb. 6-12, 1921

FOREIGN SHOWS

London	Commercial Vehicles, Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November

RACES

Paris France	Grand Prix Race, Sporting Commission	August
Buffalo, N. Y.	Dirt Track	Aug. 14
Elgin, Ill.	Road Race	Aug. 21
Johnstown City, Pa.	Dirt Track	Aug. 21
Middletown, N. Y.	Dirt Track	Aug. 20-21
Flemington, N. J.	Dirt Track	Aug. 27-28
Canandigua, N. Y.	Dirt Track	Aug. 28
Hornell, N. Y.	Dirt Track	Sept. 6
Uniontown, Pa.	Sneedway Race	Sept. 6
Syracuse, N. Y.	Dirt Track	Sept. 17-18
Allentown, Pa.	Dirt Track	Sept. 25

TOURS

Milwaukee, Wis.	Annual Fall Automobile Show	Aug. 30-Sept. 4
Detroit	Good Roads Assn. Tour	July 14-20

CONVENTIONS

Cincinnati	Ohio Automobile Trade Assn. Fourth Annual Convention	Dec. 8-10
Atlantic City	National Implement and Vehicle Ass'n, Twenty-seventh Annual Convention	Oct. 20, 21, 22

George L. Brush, special sales representative for the Elgin Six, has been appointed western zone supervisor in charge of the Pacific coast and far-western territory.

Hendricks & Landgren, distributors over the Missouri slope of Firestone products and Wisconsin tractors, has purchased the business of the Maynard Tire & Automobile Co., Bismarck, N. D., and has changed its name to the Bismarck Tire & Automobile Co.

George T. Bryant, sales manager for the Hide Leather & Belting Co., Indianapolis, has severed his connection with that concern to take up the duties of director of foreign sales for the Robert H. Hassler, Inc., Indianapolis, manufacturers of shock absorbers. His new duties will necessitate business trips to Europe and South America. He was formerly connected with Russell M.

In ransacking through the old Selig moving picture studios, Chicago, Art Director Gabriel Pollock came upon what Achille Philion, who invented it in September, 1893, maintains is the first self-propelled vehicle to infest the streets of Chicago. He recollects he scared several hundred haughty horses with his palpitating oil can during the world's fair. The engine is an antique oil burner and located so far from the Morris chair in front that the engineer had to get a leave of absence while it was in operation, which wasn't often. It was a dismal failure as a park lizard

Chicago's First Automobile



Seeds Co. and other agencies and during his association with the belting company handled the sales promotion work for domestic business.

The N. A. Petry Co., Inc., Philadelphia, manufacturers of the Petry cut-out, Petry pedal and Petry ventilator, have moved into their new four-story factory which will be devoted exclusively to the manufacture of the Petry products.

J. O. McDonald, formerly Buick agent at Zanesville, Ohio, has taken over the Columbus Buick agency which is controlled by the Ohio Buick Co., of Cleveland.

The Winders Motor Sales Co., 178 East Long St., central Ohio distributor for the Chevrolet, has opened a branch in Columbus under the name of the Renner Auto Sales Co.

Gilbert U. Radoye, director of advertising of the Haynes Automobile Co., Kokomo, Ind., has been appointed to the additional position of director of sales promotion. Mr. Radoye was formerly associated with the selling division of the Packard Motor Car Co., Detroit.

The Achen Motor Car Co., Milwaukee, distributor of the Chandler and Cleveland, is proceeding with the construction of its new sales and service building.

The Koehler-Rahn Auto Co., of Milwaukee, has been incorporated with a capitalization of \$100,000 to act as distributor and deal in motor vehicles, tractors, etc., and do a general garage and service business.

The Wisconsin Regrinding Co., Sheboygan Falls, Wis., is a new corporation with \$50,000 capital organized by William Findlay and A. P. Schneiderwind to specialize in regrinding gas engine cylinders and manufacture automotive parts.

The recently organized Paragon Tire & Rubber Co., is seeking a site in Columbus for the erection of a modern tire and tube manufacturing plant.